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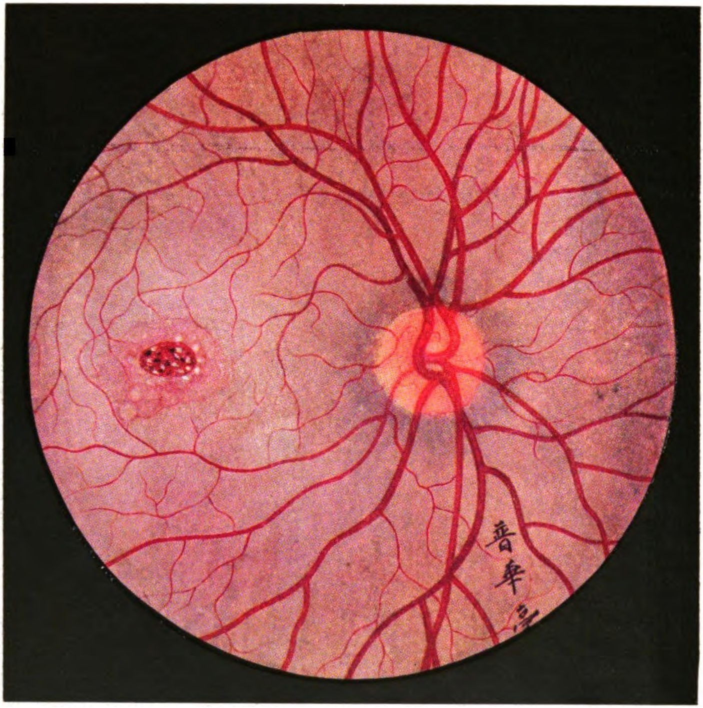
The Gift of

PLATE I.

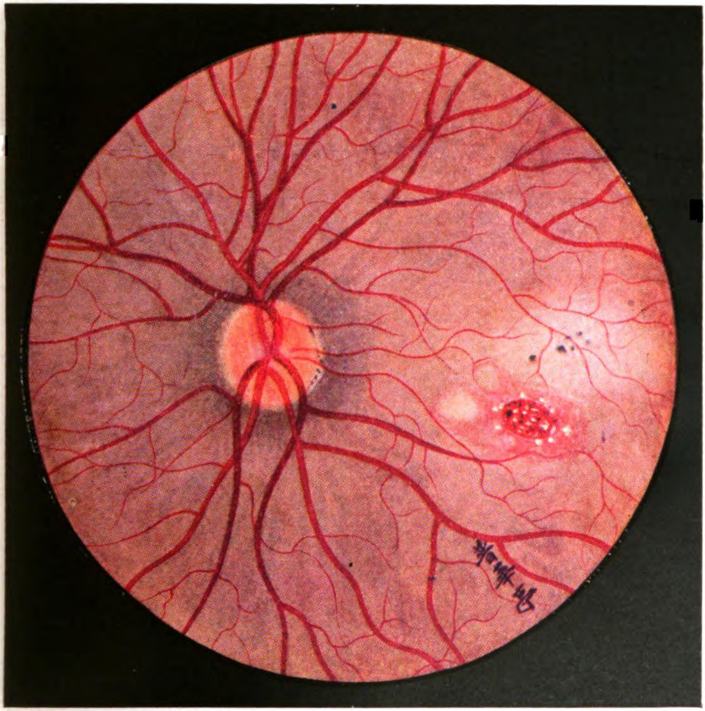


RIGHT EYE.

Bilateral hole in the macula due to one injury. Appearance one year after injury.—T. M. Li, page 91.

American Journal of Ophthalmology.

PLATE II.



LEFT EYE.

Same as Plate I.—T. M. Li, page 91.

The
Practical Medicine Series

COMPRISING EIGHT VOLUMES ON THE
YEAR'S PROGRESS IN MEDICINE AND SURGERY

Under the General Editorial Charge of
CHARLES L. MIX, A. M., M. D.

Volume III

The Eye, Ear, Nose and Throat

EDITED BY

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ALBERT H. ANDREWS, M.D.
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SERIES 1922

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DISEASES OF THE EYE.

INTRODUCTION.

The volume of ophthalmic literature shows no decrease, in fact quite the opposite, as the effects of the World War become less apparent. The experiences of medical officers in active service still hold a prominent place in clinical reports and many essays on ophthalmologic subjects find apt and wide illustration from Army records. Considerable space is still given to the relations of ocular symptoms and organic alterations as a direct outcome of focal—especially dental—infections. From the great mass of contributions to the bibliography of eye diseases the Editor, with the diligent aid of his colleague, Dr. C. P. Small, has chosen mainly those items that are likely to interest the general practitioner. On the other hand, the specialist in ophthalmology will find, it is hoped, that the more practical of the numerous papers on his subject—forming the usual percentage of the whole—have been selected for abstract and comment. We are greatly indebted for these to the *American Journal of Ophthalmology*, the *American Institute of Medicine* and to Ophthalmic Literature.

Casey A. Wood.

CONGENITAL ANOMALIES.

Heredity and Consanguinity as a Cause of Blindness. In the eleventh U. S. A. census 43,326 blind persons reported 8,342 blind relatives—that is, 19.25 per cent. had such relatives; while of 4,156 congenital blind, 1,608, or 38.7 per cent., had blind relatives. From this it appears that the proportion of blind relatives was twice as great among the congenital blind as among the blind from all causes.

Mr. Bishop Harman, referring to congenital defects, says: "A few are hereditary—that is to say, the same defect is found repeatedly in the same family for two or more generations."

The influence of consanguinity was investigated by Trousseau, who reached the conclusion that, "independent of heredity, consanguinity does not play any rôle in the production of blindness." Magnus also holds that there is no proof that consanguinity is a cause of blindness.

The diseases of the eye which are most frequently transmitted from parent to offspring are: Malformation—for example, coloboma of iris and chorioid; microphthalmia; persistence of the pupillary membrane; congenital cataract and amblyopia; nystagmus; albinism and retinitis pigmentosa. These may be transmitted in the same or like form. Myopia is frequently hereditary. Motais, quoted by Trousseau, stated that 67.5 per cent. of cases of myopia are hereditary.

That heredity is a cause of blindness seems certain, according to H. M. Ash,[1] who traces the genealogic tree of the "H." family (Fig. 1) as far back as the great-grandmother, showing that among thirty-four traced members there are eleven cases of congenital blindness. A definite history of members of the family farther back than the great-grandparents could not be obtained. All the affected members are males, the condition being transmitted through healthy females, as in hemophilia; the children of male members of the family are normal. It will be noted that of four boys three are blind from congenital microphthalmia, while the twin brother of one of the boys is normal. The one female child is normal. The father and mother of this branch are normal persons. In fact, the parents of all the blind children throughout the family are apparently normal individuals. There is no evidence of consanguinity in the family and no history or evidence of syphilis. One of the boys of the "H." family is an epileptic; all the other children are free from congenital or acquired disease apart from microphthalmia.

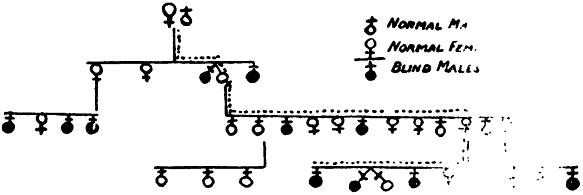

Fig. 1.—Hereditary blindness (Ash).

A. Vogt[2] finds that the heredity of certain ocular affections, congenital myopic hemeralopia, hereditary megacolocornea, heredity optic degeneration or retrobulbar neuritis, the transmission is exclusively to males through the females of the family. Thus an affected grandfather transmits to his grandson through his unaffected daughter. The phenomenon is in accordance with Mendelian transmission.

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(1) Brit. Med. Jour., April 8, 1922.
(2) Schweiz. med. Wochenschr., Jan. 26, 1922.

[Although it is the custom to talk very glibly about Mendel's law, how few of us know much about its practical applications! The Editor advises his reader to refresh his memory *now* by reading up this subject in some work of reference, say the *American Encyclopedia of Ophthalmology,* p. 7637.—C. A. W.]

Vital Stain for Corneal and Conjunctival Epithelium. O. Knüsel and P. Vonwiller[3] instil neutral red in the eye and the epithelium takes up the stain and permits direct inspection of the finest structures by this means. The staining does not interfere with vision, and the authors have seen no evidence of the slightest injury in the twenty persons treated in this way, except when the amount of the instillation was deliberately excessive. Tests in laboratory animals have confirmed the harmlessness of neutral red. In man the structure of the epithelium, which has hitherto been invisible, is made visible and it has permitted study of certain physiologic and pathologic phenomena. The staining is done with 1 drop of a 1 per cent. aqueous solution of neutral red.

The Importance of Ophthalmoscopic Examination in Children. The ophthalmoscopic examination is becoming a part of the routine examination in most hospitals for children, but as yet a great many physicians neglect this helpful aid in their daily practice. It is for this reason that J. P. Costello[4] points out some of the conditions in which the eye-ground examination is of value and should be made.

The technique used in children varies from that used in adults, for in the case of a child we have little or no coöperation on the part of the patient. About one hour before the examination the pupils should be dilated with one drop of 0.25 per cent. atropine. During the examination the child is placed upon the examination table, the room is darkened, and the child is allowed sufficient time to overcome any fear he may have. It should be given the ophthalmoscope to hold, as oftentimes the light itself will frighten him if turned on too suddenly. Once the fear is overcome the examination is begun. Instead of trying to have the child fix his eyes on any particular

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(3) Schweiz. med. Wochenschr., July 21, 1921.
(4) Jour. Mo. State Med. Ass'n., March, 1922.

object, he is allowed to roll his eyes as he pleases, the examiner focusing upon the retina. After a while the optic disc will roll into position and a good look at the fundus may be had.

The following conditions present interesting pictures, at times diagnostic in themselves, and oftentimes of great values in differential diagnosis.

Tuberculosis: Tuberculosis may manifest itself by a chorioiditis, retinitis, hemorrhage, or tubercle formation. A tubercle appears as a white spot in the retina, about one-third the diameter of the disc in size, appearing to divert a blood-vessel from its normal course. A healed tubercle appears larger; the retina is exposed in the center as an irregular mass. The frequency of tubercles of the chorioid is in direct proportion to the extent of the disease. They were present in four out of forty-eight cases of tuberculous meningitis, and were found in three cases out of four in generalized miliary tuberculosis without meningeal infection. Retinal hemorrhage without an apparent cause should lead one to suspect tuberculosis.

Hereditary Syphilis: The common finding in infancy is a mild neuritis. In childhood we find a perivasculitis, and not infrequently an optic nerve atrophy. The perivasculitis presents an interesting picture. The arteries stand out as white strands, through which the blood current can no longer be observed. Chorioiditis, or retinitis is uncommon. Punctate pigmentations are seen, especially near the periphery.

Cardiac Conditions: A rather interesting picture is present in cardiac conditions regardless of the type of lesion, and that is a mild neuritis. In aortic regurgitation the vessels are tortuous, and the arteries are seen to pulsate.

Otitis Media: In the chronic cases in which the patient complains of an impairment of vision, we may find upon examination a progressive neuritis, or a choking of the disc. This means that the abscess has extended within the cranium, giving rise to a localized abscess or a meningitis. In sinus thrombosis a mild degree of neuritis is seen.

Blood Diseases: In the severe anemias the fundus appears pale, and is often covered with retinal hemorrhages. Severe anemias are characterized by a pale fundus, the vessels standing out as pale strands. In purpura hemorrhagica the hemorrhages are very extensive, accompanied at times by an inflammation of the disc. In leukemias pale spots are seen surrounded by a bright red ring.

Infantile Chorioiditis of Unknown Origin: This is a rare form of chorioido-retinitis disseminating in type, the origin of which is unknown. The prognosis depends upon the amount of destruction. In two cases of this lesion, both infants apparently were blind.

Encephalitis Lethargica: In 50 per cent. of fourteen cases examined there was a mild degree of neuritis, which improved as the general condition of the patient improved. In those cases in which a sclerosis followed the encephalitis, the neuritis remained.

Hydrocephalus: In those cases in which the fontanelles are not closed no abnormal findings are present. When the disease comes on after the sutures are closed, it ends in optic-nerve atrophy.

Brain Abscess: When present there is a progressive neuritis leading to a marked choking of the disc. It may be homolateral, contralateral or bilateral.

Brain Tumors: There is a marked choking of the disc, at times leading to atrophy. The choking is unilateral at first, later becoming bilateral.

Epidemic Meningitis: At the onset there is a mild degree of neuritis, which improves if the child's condition improves. If drainage is blocked, or the exudate is thick, resulting in an increasing intracranial pressure, the neuritis will be progressive, resulting in a choking of the disc.

Idiocy: In the type of idiocy known as amaurotic family idiocy the typical cherry-red spot surrounded by a white area is found in the area of the maculea lutea. Aside from this form and those forms caused by a sclerosis where a mild degree of neuritis is seen, eyeground examinations are of no clinical value.

Diabetes and Nephritis: In four cases of the former, and six of the latter, in no instance was anything abnormal seen.

Pigmentations: A rather common finding in children is peculiar black pigmentation which appears as black dots, often as crescents, in groups of two or three. So far as studied, this had no clinical significance, aside from those children who gave a positive Wassermann.

Influenza: Retinal hemorrhages are frequently seen in severe cases.

Practical Perimetry. H. S. Gradle[5] states that the arc perimeter is no longer regarded as an instrument of great precision by the ophthalmologist who desires accurate knowledge of the visual fields. The knell of this instrument was sounded with the publication of Bjerrum's tangent screen perimeter and its grave was deepened by Peter's campimeter.

At first, these new instruments were essentially laboratory affairs, too clumsy and yet too delicate for routine office or clinical use. But improvements have crept in with time so that today accurate scientific perimetry may be carried on in the average ophthalmological consultation room and requires but little more space than the old arc perimeter.

The original Bjerrum screen was intended for use at two meters from the patient and at that distance was necessarily of a size that precluded its use in any but large and well-equipped clinics. But the advantages of that screen can in the main be retained by reducing the working distance between the patient and the screen, thus reducing the size of the screen. The working distance for daily routine use may be cut to 50 cm., which, of course, reduces the length of the radii on the screen.

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(5) Ill. Med. Jour., June, 1922.

An expanse of the dark-room wall, some six and a half feet square, is painted a dull-dead black. A paint known as Ripolin, imported from Holland, gives the necessary dead surface without reflection. Upon this is painted with ivory oil paint in fine line, the necessary markings

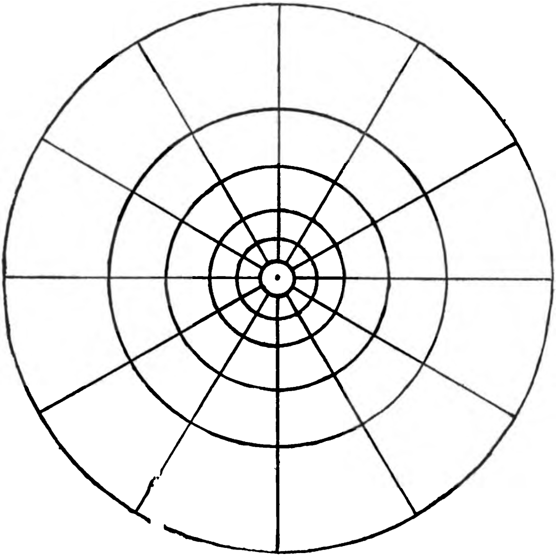

Fig. 2 (Gradle).

Angle of 10 degrees—Radius of 6.25 cm.
Angle of 20 degrees—Radius of 14.28 cm.
Angle of 30 degrees—Radius of 25.00 cm.
Angle of 40 degrees—Radius of 40.00 cm.
Angle of 50 degrees—Radius of 62.50 cm.
Angle of 60 degrees—Radius of 100.00 cm.
Angle of 70 regrees—Radius of 175.00 cm.

of the tangential screen; the absolute center, the ten degree concentric and concentrics every ten degrees to the periphery, and meridians every fifteen degrees which run from the ten degree concentric to the periphery (Fig. 2). After the oil paint has dried thoroughly, willow charcoal is dusted over the individual lines, dulling the shine and reflection, but still permitting the markings to be visible to the operator. The patient is seated on a stool, with his eye exactly 50 cm. from the center of the screen, which is marked with a 5 mm. round white spot. (A rapid method of establishing the distance of the patient from the screen is to have the handle upon which the target is carried exactly 50 cm. long.) Standing on the floor and extending over the patient's head and slightly behind the stool, is a gas pipe frame work in the form of an arch which carries five lights. The lights are of the daylight nitrogen type and carry reflectors directed toward the screen, thus supplying a uniform and constant source of light, the variances of which (due to differences in the current and wear of the filaments and to discoloration of the glass) are so slight as to be absolutely negligible. The target is in the form of a blackened cube of brass on the end of a slender 50 cm. long rod. The target that is used the most is 10 mm. in diameter and is covered with Heidelberg paper, a different color on each side of the cube (white-red, blue-green). The paper is more satisfactory than enameled colors, which can not be made in true color and which reflect too much glare. At the other end of the rod is a similar cube, only 5 mm. in size. In order to avoid attracting undue attention, the operator's hand and arm should be covered with a black sleeve.

The use of the instrument is simple and rapid. The patient is seated on the stool, with one eye covered with a black patch and with the illuminating arc just far enough behind him so that no direct light enters his eye. The distance between the patient and screen is quickly proven by means of the handle of the target carrier. The patient is instructed to watch the fixation point which is the exact center of the screen, while the operator stands at the side of the screen in such a manner that his black-covered hand may carry the target on the end of the carrier over the entire half of the screen nearest him and at the same time he can watch the eye of the patient in order to see that central fixation is maintained.

The patient is further instructed to signify as rapidly as possible any motion that his eye may perceive in the periphery of his field of vision. The target is then held so that the white-covered surface is turned toward the patient and slowly brought in from the periphery toward the center along one of the meridians. Short oscillatory motion should be given to the target in addition to the slow forward motion. As soon as the patient signifies perception of the moving object, the concentric is announced and is noted upon the visual field chart of a standard type by the nurse or attendant, who stands behind the patient. The process is then repeated upon succeeding meridians until half of the field has been covered. The operator then steps behind the patient to the other side of the screen and continues the process until the entire form field has been taken and charted.

Taking the color field is slightly more difficult and tedious. The patient is now instructed to maintain the central fixation, but to announce the color of the target as soon as the perception thereof is reasonably certain. The operator assumes the same position as for the form field but starts the target from about the 45 to 50 degree concentric. The target follows any given meridian and any one of the three colors may ge used, a change in color being effected merely by rotating the target carrier between the fingers and thus presenting a different face to the patient. The motion now is no longer oscillatory, but is merely a steady slow advance toward the center of the screen. The eye of the patient must be watched carefully as there is an almost irresistible desire to fix the target and bring the color into the line of central vision. As soon as the patient announces the color, the operator announces the concentric, both facts being entered upon the chart in colored pencil by the nurse. The target is then carried to the next meridian, but another color is presented and the procedure carried on as before. By varying the meridian under examination and the color presented, the patient is kept unaware of what color to expect and thus does not anticipate the actual perception of the color. With a patient of merely average intelligence, the entire procedure is carried out in a very few minutes, actually less time being required than to obtain similar data with an arc perimeter.

The ilumination must be constant in order to give the same comparative value. The lamps used are 50-watt daylight nitrogen bulbs, which give a very fair approximation of late afternoon daylight and cause but little distortion of color values. With such lamps, brown appears as other than its true color, but brown plays no rôle in our visual fields taken for clinical purposes. Blue, green and red appear normal. The reflectors add greatly to the uniform distribution of the light over the screen and the combination of such reflector with the daylight nitrogen bulb gives an illumination that is not dependent upon external influences and does not vary from day to day or from year to year. This uniformity allows of a comparison of visual fields taken at intervals under varying conditions, thus permitting slight changes to be detected readily and without fear that such changes may be due to variations in conditions under which the field was measured.

For rapidity of work, which is one of the essentials of practical perimetry, this target has proved most satisfactory. It does not lie quite as flat against the screen as does a disc target, but the difference in elevation is so slight that it is negligible and is more than compensated for by the gain in time. For peripheral field work, the larger target of 10 mm. in size has proved the most satisfactory. It is practically impossible, even with a large target, to outline an isolated scotoma in the periphery accurately and it is essentially for such scotomata that the smaller size of targets have proven so useful. Furthermore, a difference in the form field of as much as ten degrees in the same patient can be brought out by the use of different sized targets. Inasmuch as the endeavor is to obtain the maximum peripheral perception of the patient in question, this can best be brought out by the largest target. The same holds true for color perception and even with the largest target. It is difficult enough to obtain an accurate color field unless the patient be of unusual intelligence. In view of these observations, the use of targets smaller than ten millimeters has been reserved for central fields or for special cases.

Examination of Central Form and Color Fields: By this is meant the field of vision that lies within the twenty degree concentric, but does not include accurate delineation of the blind spot which forms a separate chapter. The first practical instrument for rapid examination of the central tangential field was Peter's campimeter, but this has been superseded by the equally rapid but far more accurate stereo-campimeter of Lloyd. This is so well known that a description of the instrument is not necessary, although some of the essential details may be mentioned. Binocular single vision is one of the requirements of the instrument; but if this is absent, the stereo-campimeter may be used as a single eye instrument where it fills the rôle of the Peter's instrument. Heterophoria is not a deterrent, as this condition is taken care of by the inserted prisms, an understanding of which is necessary for the accurate results that the instrument can yield. If there be a large central scotoma of both eyes or an equivalent condition, central fixation can be obtained having the patient place the forefinger on the center of fixation and use the muscle sense for fixation. A good uniform lighting of the screen is essential and here as well as with the wall-screen, artificial illumination is resorted to. In use, the campimeter stands on a desk with the patient seated before it and the instrument inclined on its own axis to form an angle of about sixty degrees with the vertical. On top of the desk is an ordinary, flexible arm lamp with a fifty-watt daylight nitrogen bulb. The arm is so bent that it extends over the top of the instrument and the screen is uniformly flooded with light from an acute angle, thus eliminating reflection into the eyes of the patient and at the same time avoiding the direct incidence of rays into the patient's eyes. This method insures a uniform illumination at all times and under all conditions.

Before proceeding to the examination of the central field, it is necessary to assure the binocular stereoscopic central fixation by the patient, unless there be some physical reason why such fixation is impossible. After comprehension of the necessity of such fixation, it is advisable to explain to the patient the procedure about to be undertaken in order to obtain as complete coöperation as possible. The examination should be attempted first with the smallest target provided, in white, and later in colors. If a central scotoma is found to be present, the target should be brought in from the periphery until the outlines of the scotoma can be delineated on the chart that accompanies the instrument. But if the scotoma is eccentric, it is preferable to start the target at the center and work outward until the margin of the scotoma is arrived at. The peripheric margins of the scotoma should be outlined by moving the target in from the preiphery until the border of the scotoma is reached. It is not advisable to pass the target through the scotoma and record the marginal values thus arrived at for such a method will give not only a false record of the size, but will also tend to displace the area in question.

The main meridians should be tested with the smallest white target with the distinct understanding on the part of the patient that not only must disappearance of the target be looked for, but any alteration in intensity or saturation of the color of the target must be noted. An absolute scotoma will cause the target to disappear, whereas a relative scotoma will produce an effect of decreased color saturation only. This is just as important as complete disappearance and demands more careful further investigation. Should no abnormality appear upon searching the central field with the white target, the same procedure must be repeated with the essential colors—green, blue, red. Of these three the green is most apt to show an early disturbance.

Examination of the Blind Spot: Careful delineation of the blind spot is of vital importance in the diagnosis of certain conditions, but this painstaking examination is not required in every case. A rough estimation of the approximate size of the blind spot may be made on the wall-screen or with the stereo-campimeter, and such estimation is sufficient to determine whether further and more careful examination is necessary. But the accurate measure of the blind spot can not be made on either of these instruments. In many cases, it is sufficient to know that the blind spot is enlarged and knowledge of the shape and size of the enlargement is not essential; but, on the other hand, finer points of diagnosis can be made only from the accurate delineation of the shape and size of the pathologic blind spot.

For routine clinical use, the Lloyd stereo-campimeter offers the most accurate rapid means of measuring the blind spot. The smallest white target should be used and it should be brought from the periphery toward the area in question, entering about eight points of the circumference. This will give a sufficient knowledge of the size to determine whether further investigation is necessary. The use of the colored targets is not requisite and may lead to false conclusions, for the blind spot is surrounded by a color-blind area of from one to three degrees in width.

For careful study of the blind spot, the magnet scotometer is the most satisfactory instrument. This is used at a sixty-centimeter distance from the patient and the total space required is only that of an ordinary deal kitchen table. At first it was essentially a laboratory instrument, but continued use has led to the conviction that this instrument has a definite clinical place.

It requires some space and considerable time, but the knowledge gained thereby is indispensable. The description of the instrument and its use have been published.

There remains to say but a word regarding the illumination. Daylight nitrogen bulbs are used to advantage here also, but the arch frame used for the wall-screen is not good because of the intense reflection from the white celluloid surface of the scotometer. Reading lamps, so turned as to shield the eyes of the patient from glare, are placed in such a position that the incipient rays form an acute angle with the plane of the instrument. This provides a constant uniform illumination without variation and without discomfort to either patient or operator.

The Axis of Astigmatism. In the retinoscopic examination of children, or in those on whose answers one can not rely, an apparatus devised by J. Keynes[6] works very well and adds very little to the weight of the trial frame. It will turn the cylinder while the operator is some distance from the patient, and the adjustment is so fine that this can be done five times for each division on the scale. It can be fitted to any trial frame which has a vertical bar for the nose-piece, and can be attached or removed instantly.

"The attachment is on the Bowden wire principle, and consists essentially of a flexible wire moving through the center of a flexible tube formed of a long coil of fine wire. The latter is shorter than the flex, and this difference regulates the amount of movement which can be obtained afterward. The tube is fastened to the screw of the nose-piece, from which it takes its fixed point, and its end, near the operator, terminates in a collar which is gripped between his first and second fingers. The near end of the flex is kept projecting from the coil by a weak spring, and terminates in a flat piece to take the pressure of the thumb. The distant end of the flex is joined to a clip, which grips the rim of the cylinder firmly, and this joint is really an axle, as the clip must turn over to deal with the other eye.

"In subjective testing, it is used to rotate the final cylinder, when the axis has been approximately found, and the rotation obtained with my present attachment —which has a movement of three-quarters of an inch —is 30 degrees. This is ample, as it allows for 15 degrees on either side of the approximate axis, while at the same time the patient is not disturbed nor his judgment biased by any manipulation of the trial frame. The movement is smooth, and can be reversed at any time, simply by releasing the pressure of the thumb,

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(6) Brit. Med. Jour., May 27, 1922.

when the reversing takes place immediately, there being no back-lash, such as occurs in rotation produced by means of a milled wheel."

It is in retinoscopy, however, that its greatest advantages appear. Here one corrects the meridian of least refraction and, noting the band of light which shows the axis approximately, cylinders are placed with their axis over that until correction is attained. This last cylinder is removed, and a weaker one substituted. If now this cylinder has been placed with its axis over the original bright band, the latter will appear to be in exactly the same place as before, and the mark on the glass will indicate the axis exactly. If the axis has not been placed exactly over the bright band the latter will appear to be considerably displaced to one side or the other, and a small error in placing the axis produces a much greater displacement of the bright band. For instance, an error of, say, 5 degrees in the axis of this cylinder will change the band from, say, 90 to 75 or 105. This setting of the axis is the tedious part, and has to be done by trial and error; it often requires three or four attempts before satisfaction is attained, the chief cause of trouble being the loss of the bright band as one stoops forward to rotate the cylinder, and the fact that it is no longer sharp and well-defined. It is here that the mechanical rotator is so useful, as one clips the cylinder, and, sitting back at the full distance, rotates it first one way, then the other; and, as one never loses sight of the band, one can follow its displacement very rapidly, and quickly find the right position. It is best to clip the cylinder with the spring half compressed, as release will then rotate the glass in one direction, while further compression will do so in the opposite.

Time as an Element in Testing Visual Acuity. It has been suggested by S. Rosenblatt[7] that time be considered as an element in testing visual acuity, and that, making slight allowances for differences in mentality, the patient

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(7) Ill. Med. Jour., November, 1921.

be held to a certain arbitrary degree of speed in testing his visual acuity and that the average speed be arbitrarily fixed at five seconds for each object or letter.

Snellen's test type charts are in rather common use, and being based on a visual angle of five minutes for the entire letter, and one minute for the various parts making up the letter, we have arrived at an arbitrary standard for testing vision so far as size and form are concerned, with distance as the complement. But what about the question of time? How long should a man be expected to look at a test chart before recognizing the individual letters? The time generally given varies with the patience of the oculist and the patient, as well as varying with the amount of work the oculist has waiting for him in the reception room. Hence, while one oculist may find the visual acuity of a patient to be 20/20 in each eye, another oculist finds 20/10 by dint of coaxing, helping the patient's attention by pointing to the individual letters, asking the patient to compare the letters, and making suggestions, such as where an "O" is miscalled "C," asking whether the patient detects any break in the outline of the circle. So the patient, looking long enough, thinking hard enough, and comparing accurately enough, in time manages to read 20/10 instead of 20/20. This suppositious case (and it is not unusual) is the very same patient; now, which rating correctly states the patient's visual acuity, assuming that the lighting, distance, and other elements are the same in both cases?

In the matter of visual perception by mechanical means, we have in the camera all the gradations between the fast snapshot which would be too fast to be perceived by the human eye, up to the photographing of stars which are so faint as not to be perceived by the human eye, but which are recorded upon the camera's plate only because the camera is mechanically moved so as to constantly be pointing at the star, the repeated light impressions from which, constantly impinging upon the camera's plate, finally leave their imprint there after many hours of exposure.

The one snapshot is too fast for the human eye, for the human brain, working in conjunction with the eye, or both, considered as a sense unit, and the other is too slow (or too weak in intensity) for the human eye or brain or both. Nevertheless, the human visual apparatus by education may be made to see and actually perceive (if there is a distinction) with greater speed, or may be educated to visualize over a period of time, gathering and retaining impressions which would have been imperceptible at first glance. It seems to be rational to suggest that neither of these extremes should figure in testing visual acuity. The test of visual acuity for practical purposes (and that should be the aim) would be the degree of visual acuity which the person possesses in the ordinary walks and labors of life, even test type being highly artificial and constituting only a very small portion of the objects which the average individual should be able to recognize at a distance in the pursuit of his daily happiness. Of course, allowances should be made for the evident mentality of the patient. One who is mentally alert would be expected to name the letter in two or three seconds, and one who is illiterate might be given a slightly longer time. This is all along the line of considering that the ideal test of an eye is the measurement of the use that can be made of it for everyday practical purposes, including reading words and letters merely as an incident; and the correction of defective vision should be with similar practical purposes of everyday life in mind.

Use of Stenopaic Disc in Presbyopia and Hypermetropia. The following cases are recorded by Oswald[8] as examples of the use of the stenopaic disc, as an emergency method, in presbyopia and hypermetropia:

Case 1.—Aged 58. Vision: R.=J. 6; L=J. 6. With disc, R.=J. 1; L=J. 1.

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(8) Brit. Med. Jour., Jan. 28, 1922.

Case 2.—Aged 61. Hypermetropic, wearing for distance + 4.5 D. sphere in each eye. Vision: R. = 6/60; L. = 4/60. With distant glasses, R. = 6/12; L. = 6/12 partly. With disc only, R. = 6/9 partly; L. = 6/12 partly. Without disc, R. = J. 18; L. = J. 16. With disc only, R. = J. 10; L. = J. 6. With disc and correcting lens for distance, R. = J. 1; L. = J. 1. Retinoscopy revealed astigmatism in the left eye.

Case 3.—Aged 47. Vision: R. = 6/6 H. M., with + 1.0 D. sphere, R. = 6/6; L. = 6/6 H. M., with + 1.0 D. sphere, L. = 6/6. Without disc, R. = J. 2 with some difficulty; L. = J. 2 with some difficulty. With disc only, R. = J. 1; L. = J. 1.

We have thus a simple substitute, in emergency, for the reading glasses of presbyopes.

The presbyope, even an early presbyope, without the suitable lens, is in a most helpless condition when trying to decipher the small print of a telephone directory, time table, newspaper, exhibition catalogue, etc. This small print is easily, though slowly, read by means of an improvised stenopaic disc, which can quickly be made with a piece of paper or cardboard, though which a hole 1 to 2 mm. in diameter is pierced by a pin, the point of a pencil, or knife. Such an emergency measure would be of real benefit to the presbyope, stranded without reading glasses, especially in the country or on a railway journey. A hole, about the same size, through a piece of bread forms an excellent emergency substitute for a convex lens! The tunnel formed by the fingers and palm of a partially closed fist acts in the same way, though not so clearly.

The reading distance is also much decreased. In Case 3, the patient could read J. 1 at 16 cm. with a disc; J. 2 at 29 cm. without a disc.

For distant vision in hypermetropia this emergency method would probably not be of so much practical use, though as shown in Case 2, the distant vision is much improved.

Muscle Advancement by U-Suture Fixed in the Tendon Insertion. There have been two important modifications in the operation of muscular advancement: *viz.* muscle resection, and tendon suture. Muscular section is not so much employed now, but the tendon suture has been a real progress. VanLint in 1919 revived a method originated by Wray and Kown in 1891 and 1895 consisting in muscle advancement with reinforcing suture of the muscle, but without resecting the muscle. The muscle is advanced as far as the border of the cornea but a U-suture is first passed through the tendon, to prevent dragging of the pericorneal insertions.

C. Fromaget[1] has adopted Van Lint's method of musculo-capsular advancement. At first he made the security U-suture in the episcleral tissue at the corneal edge. But the site of the supporting suture is now in the stump of the tendon and two lateral sutures are added.

Resection with tendon suture has the advantage over advancement with tendon reinforcing suture of not producing any ugly ridge at the edge of the cornea. The author however believes that advancement, especially when it is completely capsulo-muscular and reinforced at the site of the tendon, is more effective and that relaxation is less to be feared.

The Treatment of Squint. Under the term "squint" are included all non-paralytic errors of muscle balance of the eye. There has been a large amount of interesting work done on the anatomy of the extrinsic muscles of the eye, and on operative procedures to correct errors of muscle balance.

From the mechanical point of view it seems to H. Smith[2] that Nature has inserted the extrinisic muscles of the eye in such a position that each shall obtain the same

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(1) Ann. d'oculist, May, 1921.
(2) Brit. Med. Jour., Jan. 7, 1922.

maximum leverage and that this leverage shall be constant whatever the position of the eye. That is to say, the recti muscles are inserted well in front of the equator, the equator or any point in front of it being equally the position of maximum mechanical advantage. Hence the retarding of any tendon would be mechanically unsound. From the physiologic point of view, it is well known that the force with which a muscle contracts increases with the degree to which it is stretched within limits before contraction. Tendon tucking or advancement stretches one of the muscles of the eye and introduces a factor which can not be gauged.

From the surgical point of view, any cutting operation leaves scar tissue which is subsequently liable to contract, and none is more likely to do so than tendon tucking. The latter almost invariably means muscle tucking, hence it can be seen that no operative procedure can pretend to anything like scientific accuracy. In fact, in almost all cases the final result is practically cosmetic.

The employment of the electric current is advocated for the treatment of these conditions, and the author suggests that the patient should be put under gas for the minute or two required at each sitting, the eye being also cocainized, a meridional slit made in the conjunctiva about one-eighth of an inch over the muscle, and the pole insulated with sealing-wax to near the point. The muscle is submitted to a fairly strong current in this way twice a week.

If this is done the operator will probably get what shortening he requires with very few sittings; he will be able to adjust the length of any extrinsic muscle of the eye to the physiologic length; and he will run no risk of mutilation; and he can shorten permanently any of the extrinsic muscles which balance the eye. The procedure would do away with all operations for muscle balance and with the use of prisms for this purpose.

Operative Treatment of Strabismus. W. S. Franklin and W. D. Horner[3] give the results of forty-eight cases of muscle deviation which were treated surgically. They think that no one method or procedure is superior universally, and that the end-result is more a matter of the finer details and proper following out of accepted published operations.

The Reese resection was performed twenty-two times. The results were universally good with the exception of a few cases in which further operation was necessary.

The Todd tucking was employed eleven times, far better results being obtained in the later cases. A clamp operation was done nine times and tenotomy in only six cases. The muscles of one eye were involved in twenty-eight cases and of both eyes in twenty. Six patients required a second operation. The results were good in twenty-one, partial in ten, poor in nine, and not followed in eight.

All patients were operated upon according to accepted methods. The authors do not assume any arbitrary age limit. Surgery was the final appeal only when other means of obtaining a straight eye failed.

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(3) Calif. State Jour. Med., February, 1922.

Blennorrhea of the New-Born. The real danger of blennorrhea is no longer to be found in the gonococcus itself, but in the fact that the majority of cases of blennorrhea of the new-born at present are non-gonorrheal or inclusion blennorrhea and apt to be treated as of little consequence. A peculiar feature of this inclusion blennorrhea is that it is not influenced in the least nor is it preventable, by the use of Credé's method, *i. e.* the instillation of silver nitrate after birth, does not in any way prevent the outbreak of inclusion blennorrhea.

W. Mehl[5] suggests the following cautions in blennorrhea of the new-born:

1. Regard every case of blennorrhea of the new-born as a possible dangerous gono-blennorrhea until microscopic examination of smears of the secretion and epithelial smears have established the absence of gonococci.
2. When suppuration appears it is advisable to apply a 2 per cent solution of nitrate of silver, twice a day, until a cure is effected.
3. Let it be an absolute requirement, whether enforced by the law of the state or not, to instil in the eyes of the new-born, immediately after cleansing, a 1 per cent solution of nitrate of silver as a preventive.

(Departure from such generally approved practice may subject a physician to serious embarrassment.)

4. It is imperative that whatever solution of silver nitrate is used it should be fresh; in no case older than one month, whatever the character or color of the bottle or container may be.

In this connection, A. Cantonnet[6] says that more than 60 per cent. of the cases coming within his scope are not microbian. These "inclusion" conjunctivitides resemble gonorrheal conjunctivitides, but there is less reac-

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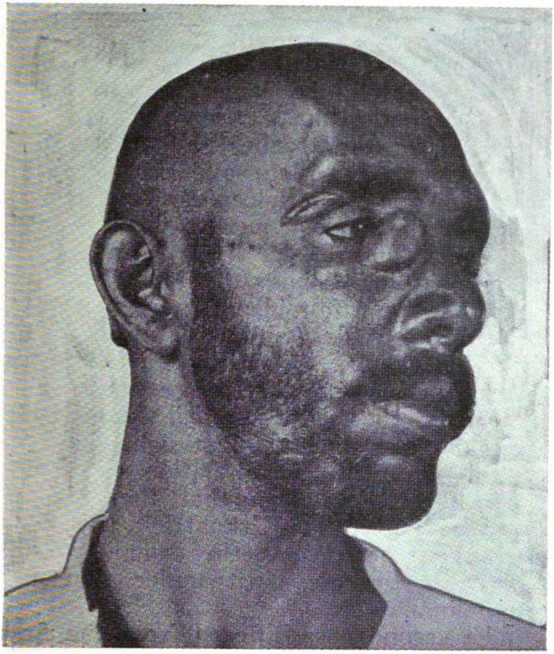
(5) Med. Record, April 15, 1922.
(6) Presse méd., May 28, 1921.

PLATE III.



Rhinosporidium Kinealyi.—Wright, page 33.

tion and less abundant pus. While the gonorrheal conjunctivitides may appear immediately or very early after birth the inclusion type does not on an average appear for twelve or thirteen days following birth. As a rule in these latter conjunctivitides the cornea is never involved, and the only inconvenience is the duration of the disease which may last from six to eight weeks, though in general it resolves in from fifteen to twenty days. Nitrate of silver instillations have no effect.

The error ought not be made that a purulent gonorrheal conjunctivitis may not co-exist with an inclusion conjunctivitis, and a bacteriologic examination should always be made; if there is any doubt use nitrate of silver. When there are no gonococci, argyrol may be used and sulphate of zinc later.

[Any reader interested in the sociological aspect of ophthalmia neonatorum can obtain information from the Bulletins issued from time to time by the "National Committee for the Prevention of Blindness," New York City. A number, recently published, and revised to January, 1922, gives a summary of State laws and rulings relating to the prevention of this formidable disease.—C. A. W.]

Rhinosporidium Kinealyi. It was formerly supposed that this sporozoon encountered most frequently in India, confined itself to the nasal and nasopharyngeal mucous membrane. Hardly a year passes that a few cases are not encountered. In recent years, however, a number of cases have been observed, in which different structures of the eye has been involved. The conjunctiva has been the most frequent seat of the lesion, which appears as a fleshy growth dotted with tiny, round seed-like bodies.

R. E. Wright[7] reports a case in which the lachrymal sac was involved. The patient had, what appeared to be, an inflamed cystic condition of the lachrymal sac (Plate III). There was a red tense swelling in the region

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(7) Indian Med. Gaz., March, 1922.

of the lachrymal sac about the size of a filbert, with a small sinus above from which thin purulent material escaped. The mass was boggy to the touch, could not be squeezed flat, but gave the impression of being filled with granulations. On examination of the nose, large masses of rhinosporidial polypi were seen springing from the inferior and middle turbinates. The sac was extirpated in the usual way, and on section was seen to consist of a fibrous wall with polypoid projections from its inner surface completely filling its lumen. The surrounding bony parts were hollowed out from the pressure of the mass but were not in any way diseased, nor was there any infiltration by the growth which apparently confined itself to proliferation on the free surface.

Parasitic Conjunctivitis (Phthirius Pubis). The following case reported by R. G. Waddy[8] is of interest in that it represents a somewhat unusual type of conjunctivitis. At the first visit it was noted to be of a curious type and showed no response to treatment while the real cause was overlooked, but responded immediately the causal factor was observed and removed.

The patient complained that the right eye had been lachrymating and burning and irritable for three weeks. The principal complaint referred to excessive flow of tears, which were continuously flooding the conjunctival sac and pouring over the lower lid. Treatment at home with a boracic lotion had given no alleviation.

There was seen to be an excess of tears and a conjunctiva uniformly congested over the tarsal plates and fornices, the scleral conjunctiva not being markedly affected. Eversion of the upper lid displayed numerous granular irregularities. A diagnosis of acute granular conjunctivitis was made though there was little or no purulent or mucoid discharge about the eye, nor was there history of sticking of the lids after sleep. There was no regurgitation from the lachrymal sac. Argyrol

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(8) Med. Jour. Australia, Feb. 4, 1922.

(20 per cent.) for use four times daily and a cleansing lotion of boric acid with zinc were prescribed.

On the next visit a week later a slight improvement was reported; the eye appeared to be *in statu quo;* and, being disappointed with the progress, with the aid of a Zeiss binocular lens a more careful examination of the lower and upper lids was then made, to discover, if possible, any blepharitic condition or involvement of the follicles of the cilia by any chronic or subacute infection. A parasite of the louse family was found moving at the base of some of the lashes of the upper lid. After preparation, seven living parasites were removed. All of them were securely adherent to the skin and lashes and all were attached among the roots of the cilia, leaving the intermarginal border of the lid quite free. The right upper lid alone was infested. No little difficulty was experienced in detaching the parasites, as they were extremely well "camouflaged" and with chameleon-like mimicry were markedly resemblant to their surroundings. Four nits or eggs were attached to the cilia.

The parasites were identified as *Phthirius pubis,* the pubic or crab louse. The eyebrows were free; the hair of the head was not infested with this nor with the *Pediculus humanus*; altogether, the patient was cleanly and well washed. So far as verbal examination went, there was no infestation of the pubic hair.

Yellow oxide of mercury ointment (1 per cent.) was prescribed and the patient on her next visit three days later reported great relief. The eye itself was well on the way to recovery. Within a week it was entirely free from congestion and the granulations had almost subsided.

The case is, of course, not unique; other reported cases indicate that the parasites may be present without causing any conjunctivitis, lachrymation or other objective symptoms.

Cysts of the Caruncle. The ocular caruncle is a small, reddish, nipple-like prominence situated on the inner side of the semilunar fold, and occupying the bottom of a horseshoe-shaped excavation at the inner angle of the eye. Histologically it is, in the words of Fuchs:

"A small island of skin containing sebaceous glands, sweat glands, and small glands like Krause's glands and having its surface covered with small, light-colored hairs."

Although its structure identifies it as an appendage of the skin, most text-book writers discuss its diseases and abnormalities in the chapter devoted to the conjunctiva, probably for the reason that, situated as it is in close proximity to the conjunctiva, it is often affected secondarily to inflammations of this membrane.

A swollen and congested caruncle may be one of the signs of eye-strain, especially "in cases of imperfect amplitude of convergence" (Weeks). For this condition deSchweinitz has suggested the name of "symptomatic or functional encanthis."

New growths of the caruncle are exceedingly rare. For example, among 60,000 eye patients, Watzold saw only six examples of neoplasm of the caruncle, of which three were congenital.

Although cysts originating from the conjunctiva are not very rare, there have been only a few reports of cases in which the cyst originated from the caruncle or semilunar fold.

Two cases are reported by J. Green, jr.,[9] who removed them under local anesthesia, and they were found to be retention sebaceous cysts.

TRACHOMA.

Review of Trachoma. Trachoma has been studied for many years by C. Nicolle[1] and he has recently pub-

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(9) Southern Medical Jour., March, 1922.
(1) Bull. Inst. Pasteur, Dec. 30, 1921.

lished the results of his investigations. The pathogenetic agent is not yet known. The disease has been produced in man and animals by inoculation of the virus obtained from typical cases. Granulations appear about ten days after inoculation. Intravenous inoculation in man and apes has given negative results.

Experimentally it has been proved that trachoma is virulent and consequently contagious during all the duration of its evolution. Diluted virus is contagious; the smallest conjunctival wound can be a portal of entry to the virus.

By other experiments it has been proved that within twenty-four hours of having touched a trachomatous eye flies can provoke trachoma.

There is no natural immunity in man against trachoma. Attempts at immunization by repeated virulent inoculations have given some interesting results, but further experiments are still necessary.

There is no proof as yet that the corpuscles of Prowazek and Halberstaedter are the pathogenic agents responsible for trachoma. These corpuscles have been found in all inoculation cases investigated by Nicolle and he thinks that they have a certain significance without being able precisely to fine it.

Necessity of Differential Diagnosis of Trachoma. Wilson[2] calls attention to the importance of making a correct differential diagnosis between trachoma and simple conjunctival folliculosis. Cases have occurred among school children in which a diagnosis of trachoma has been made, when nothing more than conjunctival folliculosis was involved. If these children were operated upon, scar-tissue would be produced which in after years, when the hardening of the tissue occurs, might result in disastrous deformities of the lids, changes in the cornea, or even loss of vision.

Trachoma and follicular conjunctivitis are very similar, and often are hard to differentiate. The latter is

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(2) Jour. Fla. Med. Ass'n., June, 1922.

only an enlargement of the lymph follicles, due to the presence of a chemical irritant reaching them, either by direct contact through the epithelium, or by way of the blood-stream, while in trachoma there is an invasion of the subepithelial layer itself, by microörganisms, which in turn are surrounded by a new formation of lymphoid-tissue.

Granulations and lymphoid formations are necessary in trachoma pathology, as they are produced by the reaction of this tissue, against the trachoma virus. Trachoma is, therefore, a type of chronic granular inflammation.

The conjunctiva in folliculosis is not perceptibly thickened, while in trachoma it is more or less so, even in the beginning. The conjunctiva is finally overcrowded in itself and is irregularly marked by cracks and crevices formed by the inverted epithelium.

In short, trachoma is distinguished pathologically from folliculosis by a true hypertrophy of the conjunctiva and by changes in the blood-vessels; that is, arranged horizontally in the cul-de-sac and not traceable over the tarsus. The essential diagnostic feature of folliculosis is that the follicles are more numerous in fornices and the blood-vessels not altered.

Trachoma has a true pathology; folliculosis, no pathology. Trachoma progresses to final stage of scar-tissue; folliculosis is benign. Trachoma virus has a comparatively low vitality. Trachoma is communicable by interhuman contact, direct and indirect, due to insanitary habits and social customs; folliculosis, not communicable.

Treatment: Very essential in trachoma, prophylactic and curative; in folliculosis, not indicated.

The Treatment of Trachoma. The problem in the management of trachoma as it is encountered in the northern and western sections of the United States, acaccording to W. L. Benedict[3] is not the prevention of ultimate blindness, for comparatively few persons in this

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(3) Minnesota Med., July, 1921.

territory who have trachoma become blind. Because of careful inspection of school children and the segregation and treatment of pupils with trachoma, the disease has not assumed the proportions of a menace in the schools. The number of persons who have such a mild chronic trachoma that they defer treatment or are content with inadequate treatment, is sufficient, however, to warrant wide investigation from the standpoint of public health because of the final impairment of vision and the economic loss of the afflicted. The cases of trachoma with which Benedict has to deal are mostly mild and only after years of moderate discomfort cause a loss of visual acuity and deprive the sufferer of the comfort and satisfaction of sight in the declining years of life.

The controversy which arose over the differentiation of trachoma and folliculosis in the early part of the last century is as yet unsettled. The workers in the hot beds of trachoma whose observation and experience cover thousands of cases treated for years admit the difficulty in many cases of making definite diagnosis. A digest of the literature on trachoma leads to the opinion that undoubted trachoma exists in localities in severe or malignant form and questionable trachoma or folliculosis exists in other communities where the malignant form is rare or unseen.

The two diseases, trachoma and folliculosis, have a common pathologic basis. They involve the adenoid tissue of the conjunctiva, appearing in the upper or the lower fornix or on the tarsal conjunctiva, and are characterized by various changes in the appearance of the conjunctiva, including the formation of small papillary protuberances, granular follicles, and hypertrophy of the conjunctiva. In many respects the appearances of the conjunctivae are identical in the two conditions and can not be differentiated at the first examination.

The pannus which accompanies acute and severe trachoma is perhaps the greatest factor in producing blindness through corneal complications as it is the most difficult to control. The presence of pannus is pathognomic of trachoma for it is well agreed that folliculosis does not produce pannus. The next factor of importance in the production of blindness is the cicatricial contraction of the conjunctiva, tarsus, and other tissues of the lid which occurs in the third stage of the disease. With these changes apparent there is no question of diagnosis and little disagreement with regard to the proper treatment. The early stage of trachoma most resembles folliculosis. The disease is then limited to the palpebral conjunctiva, the symptoms often are not intolerable and may last for years without causing the person to seek medical assistance. Persons in whom diagnosis of trachoma is doubtful should not be operated on if observation of the effects of various methods of local medical treatment is possible.

The local treatment of these doubtful cases of trachoma should be carefully carried out and its effect observed by a physician who can vary the treatment as indications direct. Folliculosis of course needs no local treatment. At least the disease is self limited and no harm will come to the eye if it is not treated.

Trachoma in the first stage should be treated by daily applications of 2 per cent. silver nitrate solution to the affected area, supplemented by simple non-irritating collyria such as boric acid, normal salt solution, or from 10 to 20 per cent. solution of argyrol. If this treatment is begun early in the course of the disease the second stage with its attendant discomforts can be shortened or aborted. Operation on the conjunctiva during the first stage is not indicated. A radical removal of tissue is followed by deeper cicatrization than follows the use of silver nitrate solution, and, while the course of the disease may be shortened, the likelihood of damage to the cornea in the later stages is increased. If local medical treatment can not for any reason be carried out operation followed by proper after-treatment is desirable. However, the proper after-treatment is identical with the treatment without operation so occasions for surgical interference are rare.

The action of silver nitrate is due to the formation with the superficial tissue of an insoluble silver albuminate which, being thrown off, carries with it the bacteria entangled in the meshes.

When silver nitrate is used in from 2 per cent. to 4 per cent. solution its action is confined to the surface of the mucous membrane, since silver combines with protoid and sodium chloride.

The silver nitrate solution should be applied to the conjunctiva of the everted lids by a cotton swab or brush. The simple instillation of the solution into the lower fornix with a dropper is ineffectual if not really harmful. The eye may be previously cocainized if the patient so desires, but often the cocaine solution causes more disagreeable symptoms than the silver solution. In the application of the silver solution the patient should look down while the physician holds the everted lids firmly to the face and the swab is made to brush lightly or heavily over the diseased surface, and especial care taken to apply it to the border of the tarsus nearest the fornix by lifting the tarsus with the swab. The lids are held open until a white film is seen to form where the silver is applied, the excess is then immediately washed off with boric acid solution or salt solution. The lids should then be replaced and the lower fornix again irrigated thoroughly. The amount of reaction the day following the treatment should be an indication of the efficacy of the treatment. If the treatment has not been too severe the white membrane will have disappeared completely and a soft red velvety surface be exposed. If the membrane has not disappeared or the surface tends to bleed easily the treatment has been too severe and should not be repeated until the membrane has exfoliated and the reaction subsided. It is better to apply the silver solution in the morning so that during the working hours the tears will irrigate and flush out the cul-de-sac. At night the lid margins and skin of the lid should be covered with a non-irritating ointment, such as White's, or boric acid ointment, to prevent excoriation and fissures. This treatment should be kept up with only slight omissions for from two to three years.

If treatment of the disease is not begun in the first stage or if for some reason the disease has not been arrested successfully we are confronted with a more serious problem. Pannus, ulcers of the cornea, and secondary infection are added to the structural and functional changes of the first stage and require strict attention. However, the same treatment should be applied, but the mechanical removal of large granules by expression or scarification may in certain instances be beneficial. Operation should not be radical, except in the most extreme cases. The lightest touch with sand paper or gauze dipped in 1:500 bichloride solution sufficient to scarify but not destroy the tissue is all that is justified by results. This operation should be considered a hastening step in the treatment of the disease, not a substitute for the medical treatment. Corneal complications are admittedly stubborn in the second stage of trachoma because they tend to recur frequently but yield to treatment. The application of silver solution to the conjunctiva may be all that is necessary, combating secondary infection and the toxic effect of decomposing granulations. Usually it is better not to apply a dressing to the eye as it interferes with drainage of the secretion. Boric acid powder with iodoform powder in equal parts dusted onto the cornea gives excellent results. It may be applied within a few minutes after the application of the silver solution to the conjunctiva. Cauterization of corneal ulcers is seldom necessary unless active secondary infection has been implanted.

During practically the entire first and second stages trachoma can be treated satisfactorily by the use of silver nitrate solution alone. A 2 per cent. solution can be used as an astringent or as a cauterizing agent by varying the amount applied and the length of time elapsing before the neutralization with sodium chloride or the washing with boric acid solution. When the disease is well under control and the symptoms have disappeared the silver solution may be discontinued profitably for a few weeks or a few months and a solution of zinc sulphate of from 1 to 3 grains to the ounce given for frequent instillation. A satisfactory method to follow is to stop the use of silver and substitute the zinc solution for one month in three. The zinc solution and ointment for the lids can be used by the patient at home with perfect safety.

Comparatively few patients in the north central states who have trachoma are situated so that they can not have frequent consultation and treatment. However they must be urged to pay strict attention to the treatment and instructed to report for observation at regular intervals. The blindness which follows trachoma is often preventable and every physician should make it his duty to help lower the percentage of blindness from trachoma in the west north central states. Patients seldom realize the danger and must be urged to persist in treatment even after their symptoms have abated and they believe themselves to be cured. The treatment commonly carried out is too desultory. The response to treatment is in proportion to the skill of the physician and no better piece of handiwork could come from his efforts then to handle a case of trachoma so that the misery of its sequelae are made as slight as possible.

Serologic Treatment of Trachoma. T. Kleczkowski[4] of Posen has found that the serum of men attacked by trachoma is much more toxic for rabbits than the serum of men in good health. In a number of experiments he demonstrated that the natural hemolysins of the blood serum of rabbits much more strongly hemolyze the red corpuscles of men attacked by trachoma than

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(4) Archiv. d'ophtal., January, 1922.

the red corpuscles of men in good health. He has obtained much the same results in experiments with the serum of rabbits sensitized by human red corpuscles. From all his experimental researches it has been shown that the blood serum as well as the red corpuscles of men attacked by trachoma are biologically different from the serum and corpuscles of men in good health. There is a chemical difference in both substances, the chemical substances in the trachoma cases provoking hemolysis. In endeavoring to determine the nature of these chemical bodies, Kleczkowski used the method of serum complement. His experiments on this subject have demonstrated to him that while the inactive serum of healthy men heated to 56° C. may be easily activated by the fresh complement of guinea-pig serum, the complement of the inactive serum of men attacked by trachoma is not so activated. The experimental investigations prove that the bodies provoking hemolysis in the serum of men attacked by trachoma have a construction different from that of the hemolysins in each serum.

THE SCLERA AND CORNEA.

Blue Sclerotics. The authors of this article are O. Blegvad and H. Haxthauser.[5] When the sclerotics are abnormally thin, as in buphthalmus, and even locally after scleritis, the white part of the eye assumes a bluish color, because the dark uvea shows through. But a bluish color of the whole sclera may be congenital, and is most often found in connection with bones so slender and fragile that fractures are occasioned by the slightest cause—as, for example, slight blows or fall from a small height.

The description of the disease "blue sclerae and tendency to fracture" was published for the first time by Eddowes in 1900. [The condition known as "Blue Sclerotics" was first mentioned by von Ammon in 1841.—C. A. W.] Eddowes saw the disease in a father and his daughter, and he is of the opinion that the blue sclerae, as well as the tendency to fratcure, are due to an inherited defective structure of the fibrous tissue of the body. If we look at the published pedigrees, the conditions of heredity seem to be of such a nature that the whole matter seems to be in accordance with the view adopted by Groenow that the anomaly is inherited as a dominating quality according to Mendel's theory.

Besides blue sclerae and tendency to fracture, other anomalies are described. One of the most frequent seems to be deafness. Van der Hoeve and de Kleyn who were the first to describe this symptom in connection with the blue sclerae, found hardness of hearing or deafness in all the members of the two families in question who suffered from blue sclerae and tendency to fracture.

As regards the cause of the disease, a great deal seems to indicate that this is due to an inherited anomaly of the mesoderma. The blue color of the sclerae is due to the sclerotic being so transparent that the uvea shows

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(5) Brit. Med. Jour., Dec. 24, 1921.

through more than normally; the transparency, in its turn, is due to the sclerae being thinner than usual, as proved by measuring an enucleated eye, the sclera of which was only one-third of the ordinary thickness.

The tendency to fracture is due—as is proved by several examinations by *x*-rays to thinness of the bones and defective calcareous development. Further, a relative thickening of the compacta at the expense of the spongiosa is found—probably a result of former fractures—in addition to older and newer fracture lines as well as flexures of separate bones and of the whole bony system.

The deafness is, in some cases, due to otosclerosis and in other cases to labyrinthic disease.

The real cause of all the symptoms is quite unknown as yet. Some authors think that it is due to disturbances of internal secretion, while others connect the disease with inherited syphilis; but none of these theories has yet been proved.

A case of this rare disease is reported by Blegvad and Haxthausen more interesting because the patient suffers from a cutaneous disease, which perhaps is connected with the other symptoms, and which has not before been described as part of this disease.

The lower part of the neck and the upper part of the chest are affected with a strange cutaneous disease which appears zonularly. In front there are definite spots varying in size from a millet seed to a farthing (dime), of a greyish purple color, and of a somewhat irregular or oblong form. The surface is below the level of the surrounding skin, and the veins show through distinctly. At the edge of these parts, which at some places join into great patches, a narrow hyperemic border is seen. The surface of the skin in the affected parts is atrophic, smooth, without scales or crusts, and the hair follicles seem to be natural. The sebaceous glands come out strongly as small white points. On the back of the neck, where the spots are smaller but of the same form, they have a somewhat different appearance. The color is more red-purple and the atrophy less pronounced, and in some of them there seems even to exist a slight infiltration. The healthy skin is richly covered with hair and has no anomalies of pigmentation. The color of the hair is dark blonde.

In addition to the possibility that cutaneous atrophy may be a symptom parallel with the blue scleroties, the brittle bones and the hard hearing, it is probable that the debility of the mesodermal tissue may predispose to the development of the cutaneous atrophy, although the latter may be produced by other causes.

Report of Case of Blue Sclerotics. Such cases are sufficiently rare to warrant putting on record the following history, as reported by J. B. Alexander.[6]

The patient, aged 7½ years, had suffered from repeated fractures—the most recent having been one of the lower end of the right tibia. Some deformity was present in the right leg and the right thigh, and it was ascertained that both the tibia and the femur had been previously fractured—the latter having occurred at birth. In addition, a history was obtained of past fractures of the left humerus and the tibia and fibula of the left leg. These had healed with apparent perfect union and minimal amount of callus. The most striking feature which one observed, was the marked blueness of both sclerotics. The child was somewhat pale and debilitated, the forehead more prominent than normal, but no evidence of rickets was apparent. In other respects the boy had always been healthy. The mother, to whom the boy bore a strong resemblance, showed very deep blue sclerotics. She had, however, no fractures. Her hearing was defective, and she stated that she had suffered from deafness for many years. The patient's two sisters also presented blue sclerotics, with, however, no history of fractures. An aunt of the patient (the patient's mother's sister) had sustained altogether seven fractures during her life and had, as in the other mem-

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(6) Brit. Med. Jour., Apr. 29, 1922

bers of the family, deep blue sclerotics. The grandmother and great-grandmother had both been the subjects of fragile bones and blue sclerotics. No further history of these phenomena was forthcoming in previous generations to the ones already mentioned; it is quite possible, however, that a careful study of this family's genealogy would have revealed the same condition in former generations.

There seems to be little doubt that the blueness of the sclerotics is due to the increased transmission of the color of the chorioidal pigment and not to any inherent coloring of the sclerotics themselves. Some think, however, that there is an actual thinning of the sclerotics. Fridenberg has suggested that the blue sclerotics are due to a transparency depending upon the absence of lime salts in the connective tissue of the sclera. The long-standing deafness in the case of the mother described is worthy of notice, and might possibly be explained, as Bronson suggested, by a deposition of calcium salts in the middle ear, relating to the abnormal osteogenetic process.

Ulcer Serpens. L. E. Maire[7] outlines briefly the chief characteristics of this virulent form of corneal ulcer, and suggests some of the methods of treatment that have proved to be more or less successful.

Ulcer serpens, as the name indicates, is an ulcer of the cornea characterized by its tendency to invade the corneal tissue, in a serpentine or irregular manner. Descriptively it differs from the common form of corneal ulcer, which is quite generally concentric in outline. It differs also etiologically from the fact that the active agent in the causation of ulcer serpens has been shown to be a microörganism known as the Fraenkel-Weichselbaum *Diplococcus lanceolatus*.

In ulcer serpens the so-called edge of progression marking the course of advancement, possibly in a single direction, together with radiating striae extending from

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(7) Med. Rev. of Reviews, December, 1921.

the edge of the ulcer into the normal corneal tissue are, in fact, lanes filled with wandering leukocytes—these are well-marked characteristics upon which we base a differential diagnosis.

This form of ulceration is one affecting persons in middle life and old age, found mainly in the working classes, who have been exposed to corneal injury; hence a history of trauma very often precedes its appearance.

Ulcer serpens has been classified bacteriologically as a pneumococcus ulcer; it has been shown by investigators that the pneumococccus is the ultimate cause of the ulceration, being found as reported by some in from 90 to 95 per cent. of cases. Adventitious bacteria may also be present, but are to be considered as accidental, although they may by their presence keep up a diseased process quite independent of the original bacteria.

The course of the infection in a very large percentage of the cases will be found to come from the lachrymal channel or a conjunctivitis. In case of a trauma of the cornea, in a workman, a careful search should be made especially to ascertain the condition of the conjunctiva, and sac of the eye injured. The extent of the ulcerations will depend upon the virulence of the pneumococci and local power of resistance. The process may not extend beyond an infiltration and subsequent clearing of the corneal tissue.

We are all familiar with the formidable appearance of the severe type of infective ulceration of the cornea, the rapid breaking down of its structure, the iridic deposits with hypopyon caused by diffusion of toxines into the anterior chamber, together with hyperemia and edema of the conjunctiva, presenting a picture of a violent destructive action that strikes terror to the stoutest heart. Should perforation take place and the pneumococci gain entrance, the deeper tissues will become infected by the attacking bacteria. Owing to the ever-increasing field and diversification of labor, ulcer serpens has an important social aspect. In the severe cases the resultant scar which follows the course of healing decreases more or less the earning power of the individual.

We all know that the cornea is capable of sustaining a considerable injury with a minimum of damage after recovery, under aseptic conditions, and, on the other hand, vision may be lost from a slight abrasion of its surface when exposed to an infected secretion.

In the treatment of this condition, a twofold object should constantly be kept in view, the curing of the disease and a minimum of opacity subsequent to healing.

Paracentesis of the cornea as occasion may require, together with the instillation of antiseptic solutions and a pressure bandage in all cases, are a necessary part of the treatment. In cases of severe ulcer of a malignant type, the cautery or a Saemisch have always been considered in the past as the last resort. Occasionally both fail.

As stated before, a steady purpose should be maintained, that of looking toward the preservation of vision in any form of ulceration of the cornea. To accomplish this we must attack its cause as early as possible. This is in line with progressive medicine. As bacteriologic examination has shown the presence of bacteria as an active agent in the causation of infected ulcer, it would seem that in bacterial therapy we should find a logical and valuable means of treatment, by the employment of either the serums or vaccines, the destruction of the bacteria being accomplished by an antibody, supplied passively by a serum or actively by a vaccine. Loeffler has shown that the eye participates in the general immunization of the body. Roemer makes the broad statement that antibodies pass into the structure of the nonvascular cornea, in active and passtive immunization. His experiments have confirmed this positively. He recommends in ulcer serpens as high as 50 c.c. of pneumococcus serum given at once, to be repeated as indicated by the condition of the ulcer. The use of the indicated serum in a given case will surely reinforce the employment of other recognized methods of treatment.

A great deal of attention, these last few years, has been given to the use of vaccines. The theory of vaccine therapy, according to Sherman, is based upon the active immunization of the tissue cells of the body, thereby producing antibodies by a rapid sensitization in specific proteolytic ferment production.

The taking up by the blood serum of the dead bacteria, the contact of which with similar live bacteria in local foci sensitizes the blood cells, increases the antibody production, and raises the opsonic index, or, in other words, increases the phagocytic power of the blood cells. In the case of ulcer of the cornea, the comparatively small area could hardly produce sufficient antibody to overcome bacterial activity. Were it not for the well-known transudation or absorptive power of the cornea, it is highly probable that but little effect would be attained by this line of treatment.

The efficacy of vaccine treatment in eye diseases has not been generally accepted by the medical profession, nor has it been given sufficient credit and such importance in the treatment of certain diseases of the eye as it deserves. Vaccine therapy, like every other system of therapeutics, has its limitations. The preposterous claims made in its favor here and there by writers as a cure-all have hardly any foundation, and yet in an infective disease of the eye, with known bacteria present, the use of the proper vaccine for the stimulation of an antibody production, is not only scientific, but experience has shown it to be a potent factor in the promotion of a cure. It may be argued that disappointment often follows its use. This is true, but its failure may be due to a faulty procedure and lack of experience. The routine injection of a vaccine will not accomplish much. We must apply this remedy intelligently to obtain results. The first requirement is the use of the proper vaccine. A mixed bacteria vaccine is often found to be essential and advisable. Its strength, period of administration and continuance of treatment are important factors. One must take into consideration, by the comparative effect as circumstance may require, the interchange of the stock or autogenous vaccines. It seems to be a condition or requirement that the use of the vaccine should be continued for a time at lengthened intervals, after the disease action has subsided. The observance of this precaution will have a material influence in stimulation and absorption of the products, thereby greatly decreasing the formation of corneal opacity.

According to B. Fleischer,[8] ulcer serpens usually begins with infiltration and a slight hypopyon with iritis. At this epoch energetic treatment is necessary. There is usually a dacryocystitis. It is very important to determine the nature of the infecting agent and the exudate should be examined. If the pneumococcus is found, hydrochlorate of optochin should be employed; but sulphate of zinc should be used if diplobaccilli are present.

A wad of cotton mounted on a stick is dipped into a 20 per cent. optochin solution and is applied to the ulcer for two minutes, after cocainization, slight friction being exerted toward the end of the application. It causes a slight cauterization and whitening of the ulcer. An occlusive bandage is then applied.

The iritis is treated by atropine. If the intervention is successful the ulcer on examination the next day will be found to have ceased progressing; a 10 per cent. optochin pomade is applied, but if it seems necessary the first ten days treatment will be repeated.

If the ulcer is due to diplobacilli, sulphate of zinc treatment will succeed even in advanced cases. This is used in frequent instillations of 0.5 per cent.—a drop every one to two hours. In two or three days the ulcer begins to regress. A zinc sulphate pomade should be used at night. If the infection is a mixed one due to diplobacilli and pneumococci both medicaments should be combined.

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(8) Münch. med. Wochenschr., Jan. 20, 1922.

Hypopyon Keratitis. Schinck[9] treated fifty-two patients with progressive hypopyon keratitis by irradiation with violet light. There were twenty-seven severe cases, twenty-one medium and four slight cases. The results may be considered as very good in nineteen, good in twenty-four, and unfavorable in nine.

In comparison with results obtained prior to the use of irradiation, the prognosis is now much more favorable, especially as regards visual acuity. Actually in the Birch-Hirschfeld Ophthalmological Clinic the ultraviolet light treatment gives the maximum of security. Cases with deep infiltration with hypopyon and marked iritis react in an extremely rapid manner, and if the irradiations are continued after epithelialization the cicatrice obtained is so fine and clear that vision is almost restored to normal.

Clinical and Experimental Results of Iontophoresis in Treatment of Corneal Lesions. R. Birkhauser[1] uses a glass tube electrode open at its lower part, with smooth edges and embracing the cornea and limbus. It is placed on the previously anesthetized eye of the patient in such a way that it surrounds the cornea and is fixed by the lids. The solution employed as an electrolyte is poured into the glass tube and the metallic ring conducting the current plunged into the electrolyte. The indifferent electrode is held in the patient's hands. Only the surface of the cornea is in contact with the fluid employed as electrolyte and it can not be mechanically injured. The electrode tube being transparent acts as a blepharostat and the field can be viewed as the iontophoresis is applied.

Outside of treatment with chlorine or iodine, the author has never found corneal lesions; but he never exceeds 2 milliamperes for two minutes. With the two chemical agents mentioned, he at first noticed some epiphora and a slight injection of the ocular globe. The

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(9) Zeitschr. f. Augenhlk., December, 1921.
(1) Rev. gén. d'ophthal., July, 1921.

cathode should be wrapped in cotton to avoid irritative phenomena.

Some authors consider that iontophoresis with chlorine or with iodine has a sclerolysant effect and that notable improvement of the visual acuity followed from this method. Others think that the action is exercised only on recent spots and not on old spots. Birkhauser himself has never seen an old spot disappear and leave the cornea transparent. About thirty iontophoresis treatments are necessary in old cases and the method requires great patience.

From the study of eighty-six cases in the Lucerne Hospital in which iontophoresis was tried P. Pietta[2] says that iontophoresis with zinc sulphate is the most powerful means quickly and surely to arrest infectious corneal processes. It has a particularly good action on serpiginous ulcers and in cases of herpes; it has the advantage over thermal and chemical cauterizations in that it does not destroy the surrounding healthy tissue, with resultant small transparent scars. As regards iontophoresis with chlorine and iodine, because of the unquestionable sclerolysant action it is the most efficacious clearing up agent known. Its action is specially effective in recent cases but it acts favorably also in cases of old standing.

Degeneration of the Cornea. Under the title "Degeneration of the Cornea," we distinguish chiefly four forms—hyaline, calcareous, colloid, and amyloid. These degenerations have already been considered clinically and histologically by many authors, whose opinions regarding their origin and the mode of formation do not coincide. Moreover, the homogeneous, highly refractile, organic degenerative material, which appears clinically as yellow spots in the cornea, has been termed by different authors: colloid, hyaline, and amyloid, respectively.

Magly[3] reviews the hitherto expressed important opin-

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(2) Rev. gén. d'ophthal., January, 1922.
(3) Calif. State Jour. Med., November, 1921.

ions of the origin and mode of formation of this material:

Degeneration of the cornea was first described by Baselin as amyloid, in an eye that was staphylomatous. He found in the superficial layers of the scar of the human cornea peculiar, highly refractive, organic masses of various shapes, not unlike those pictures which Goldzieher, Saemisch, Wedl and Bock described as colloid of the cornea, which, however, with a 2 per cent. iodine solution gave the typical amyloid reaction. Baselin is of the opinion that the refractile masses are in no way related to cells of the epithelial layer, and when found in this situation have invaded the same from the stroma cornea below.

E. von Hippel arrived at the same conclusions regarding the amyloid reaction. He regarded the refractile masses as taking their origin from altered red blood cells.

Saemisch described in the epithelial layer and in the scar tissue of the cornea the appearance of rounded, drop-like and facetted cavities with thickened walls, formed by material which had a strong light-refracting capacity, which might be considered colloid bodies.

Goldzieher described in a scar staphyloma immense accumulations of colloid in the superficial layers of the cornea.

Wedl and Bock mentioned the appearance of colloid bodies in the cornea of eyes that showed nutritional changes.

Schiele considered the refractile masses were not of an amyloid nature, but were composed of glycogen.

Kamicki clamed the homogeneous, strongly refracting globules were hyaline in nature, from the manner in which they stained.

Baquis expressed the opinion that colloid and amyloid might have the same origin, or at least bore a close relationship. In his opinion the colloid material took its origin from the epithelial cells, or from the fluid circulating in the cornea.

Vossius considered the calcareous deposits were secondary to an inflammatory growth of the connective tissues, the refractile masses breaking through Bowman's membrane.

Sachsalber concluded that the refractile bodies were always extra-cellular and primarily belonged to the cicatricial tissue, and when found in other parts of the cornea, they arrived there secondarily.

Birch Hirschfeld believed the refractile bodies were hyaline as von Recklinghausen applied the term. This author points out that hyaline is possibly an antecedent stage of amyloid degeneration; this at least would tend to explain the amyloid findings of Baselin and von Hippel as being cases of longer standing.

Wyssokowitsch considers hyaline degeneration as a change of the endothelium and its derivatives as well as of the tissues genetically conceded with it, keratohyalin and colloid, as changes of the epithelium, the former of the flat, the latter of the cylindrical.

Rubert does not hesitate to declare the refractile bodies are hyaline and believes trachoma is associated or has preceded the attack in all cases.

v. Recklinghausen applied the term colloid to all the homogeneous transparent-looking substances, including mucin, colloid and amyloid, and reserved the term hylin for a special group, which, according to him, is characterized by the following peculiarities: It resembles amyloid in physical characteristics, but does not react to iodine; it stains deeply with acid dyes, such as eosine and acid fuchsin.

Ernst differentiates two groups of hyaline substances, colloid and hyalin, by means of the reaction to Van Geisen's picro-acid fuchsin solution. According to him, true hyalin stains with acid fuchsin alone and appears a deep red color, while colloid stains with both picric acid and acid fuchsin. He believes hyalin has its origin from the connective tissue or from the blood-vessels. v. Kahlden claims that colloid often stains a deep blue.

Unna has shown that in the skin connective tissue cells can give rise to the so-called true hyalin, of which part is acidophilic and part basophilic, while the intercellular substance gives rise to colloid.

According to Fuchs, zonular opacity of the cornea is the most frequent of the pathologic types of the dystrophies. It forms a grayish band from 3 to 5 mm. broad, which passes straight across the cornea, a little below its center. It develops with extreme slowness, occupying years in its progress, the first parts to appear being the two terminal points of the opaque band; that is, the portions of the opacity lying nearest the upper and inner margins of the cornea. These points are always separated from the margin of the cornea by a narrow, transparent zone. Starting from there the opacity gradually pushes its way toward the middle line, where the two parts of it unite, and thus close in the opaque zone which covers the lower half of the cornea. This zone is, accordingly, broadest and most opaque at its two extremities, these being its oldest parts.

On examining the opacity more closely with a corneal loupe, we ascertain that the opacity, which is sharply defined on all sides, is composed of minute white or grayish dots which lie somewhat superficially in the epithelium or directly beneath it; for this reason we often find the surface of the cornea over the opacity roughened like shagreen or covered with minute prominences. Often in the midst of the opacity we see roughened or rounded areas which are clear, or the opacity is traversed by fissures or chinks, and portions of the opacity may actually drop off altogether.

Zonular opacity of the cornea generally develops in eyes which have nearly or quite lost their sight in consequence of some intra-ocular affection (irido-cyclitis, glaucoma), and in this case it is of practically little significance. It is only very rarely (and then only in elderly people) that we encounter it in eyes which are otherwise sound, so that here the corneal opacity itself is the sole cause of the disturbance of vision (senile zonular opacity).

Homotransplantation of the Cornea. Homoplastic transplantation of the cornea in its entire thickness has been attempted many times with practically constant failure. However, if this operation be performed under proper conditions, the transplanted fragments can remain transparent, and the curvatures of the cornea normal. This fact was demonstrated by Zirm (1906), who resected part of the leucoma and substituted for it a flap of normal cornea taken from the enucleated eye of a boy. About a year after the operation, the patient could see through the transplanted cornea. Although it had been implanted in scar tissue, the flap has remained transparent. Such a result is exceptional, and many other attempts have been unsuccessful. As the inadequacy of the technique was probably responsible for the failures of the operation, it would be important to improve the method of transplanting the cornea in such a way that it could be used as a routine procedure in cases of leucoma. Ebeling and A. Carrel[4] have been conducting some experiments in order to develop a better technique for homoplastic transplantations.

The technique consisted essentially in using a very large rectangular flap, fitted like the door of a safe into the edges of the corneal opening, and in fixing it securely in its position by stitches. This technique had been developed by Carrel in 1912, in the course of unpublished experiments on autotransplantation of the cornea.

Preparation of the Eye: The experiments were performed on cats. Cultures in bouillon were made of the secretion of the conjunctiva and only animals whose conjunctiva was found to be sterile were used. The hair covering the palpebra and the skin surrounding the eye were cut with scissors. Several days previous to the operation, the eye and the surrounding skin were washed with mercury bichloride at 1:5,000. Immediately before

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(4) Jour. Exper. Med., November, 1921.

the operation, the surrounding skin and that of the palpebra were washed with alcohol, and afterwards tincture of iodine was applied.

Preparation of the Graft: The graft was taken from the eye of a cat under ether anesthesia. The outline of a rectangular flap 6 by 8 mm. was traced on the surface of the cornea with a sharp cataract knife. The surface was incised to a depth corresponding to about half the cornea. Then the internal edge of the flap was dissected a distance of 1 mm. The anterior chamber was opened, the incision of the posterior part of the cornea continued with the scissors, the flap removed, and put in olive oil until it was used. Its anterior surface was 6 by 8 mm., while its posterior surface was only 4 by 6 mm. (Fig. 3).

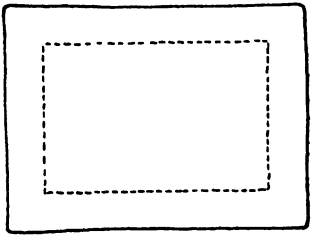

Fig. 3.—Anterior aspect of flap (Ebeling and Carrel).

Resection of the Cornea and Transplantation: The animal was etherized by the Meltzer-Auer method. The head was placed on a sand-bag and covered with a black silk towel, perforated in the center. The operating field was widely exposed by four small forceps fixed to the conjunctiva. The graft was placed on the surface of the cornea and the outline of the fragment to be resected

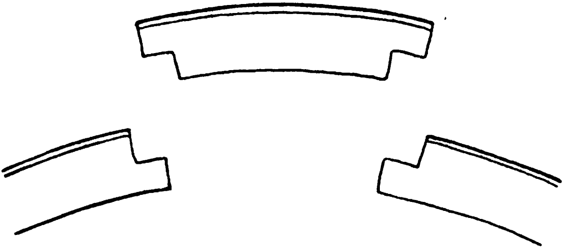

Fig. 4.—Cross-section of corneal flap and opening in the cornea, showing step edges (Ebeling and Carrel).

was traced with the point of a cataract knife. Then the graft was replaced in olive oil. The incision of the cornea was made to a depth of about 1 mm. Then the internal edge was dissected for 1 mm., the anterior chamber was opened, and the fragment resected (Fig. 4). The graft was immediately inserted in the opening, where it fitted the edges of the cornea exactly (Fig. 5).

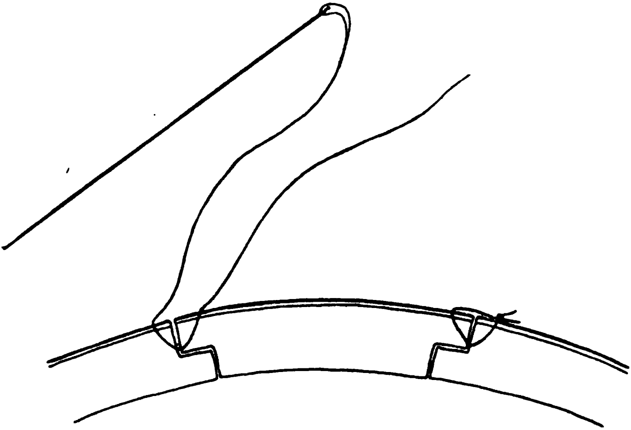

Fig. 5.—Transplanted flap in position, showing stitches passing through the superficial layers of the transplant and edge of opening in the cornea (Ebeling and Carrel).

Fixation of the Graft: The suture of the graft to the cornea was made with straight needles, No. 16, and silk sterilized in vaseline. As the corneal tissue is very hard, prong-toothed dissecting forceps were used, the ends of which were bifurcated like a very small, double-tined fork. The edge of the flap was seized by the forceps and the needle pushed through the tissue between the tines (Fig. 6). Only the superficial part of the cornea was caught by the needle. Each angle of the flap was fixed by one stitch. Another stitch was placed on the longer side of the rectangle. On account of the shape of the edge, the incisions were closed tightly, and there was no leakage of fluid from the anterior chamber through the line of incision (Fig. 3).

Postoperative Treatment: In previous experiments, it had been found that the dressing was often a cause of irritation. Therefore no dressing was applied. The animals kept the operated eye closed for several days after transplantation. The corneal stitches fell out after a short time.

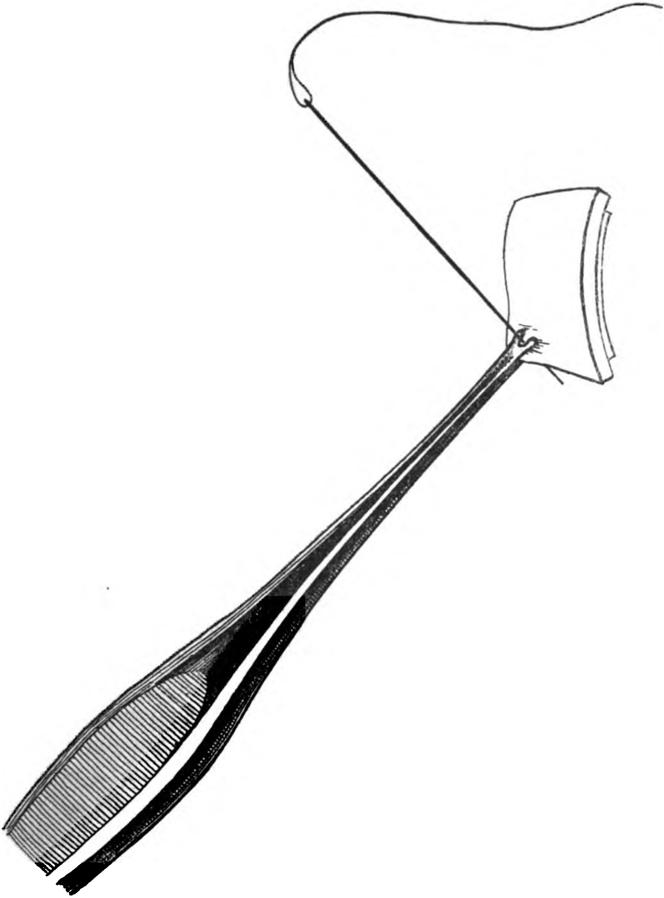

Fig. 6.—Prong-toothed dissecting forceps holding corneal flap and needle stuck through the tissue (Ebeling and Carrel).

The experiments were made during an epidemic of distemper. Five cats were operated upon. Two died from distemper some time after the operations. Two others had a marked local infection of the eye and the cornea became completely opaque. In the fifth experiment the animal remained in good condition and the cornea transparent. A month later, the stitches had disappeared, the cicatrization was perfect, the cornea clear, and its curvatures did not appear to be modified. The iris was not adherent to the cornea. There was a very small opaque spot near the inner canthus. Since that time, the animal has continued in the same condition. Two years later, the cornea was perfectly transparent, the only evidence of a previous operation being a hardly visible opaque spot on the internal part of the cornea (Plate IV). Examination of the eye shows no line of demarcation to indicate the limitation of the corneal graft could be seen with a Zeiss loupe. Corneal epithelium perfectly even. No lack of corneal luster. Oblique illumination showed no inequalities of the corneal surface. Cornea was sensitive. Transplant perfectly transparent; no infiltration or vascularization. Ophthalmoscopic examination showed clear image of the fundus. Near the inner canthus and in the portion comprising the original cornea, there was a faint infiltration of the deeper layers with two or three small blood-vessels. This opacity was of a striate appearance and gave the impression that it was produced by trauma during the operative procedure.

The result obtained in this experiment shows that the technique which was used allows a perfect reconstruction of the cornea, even when a very large fragment has been resected. The cutting of the flap is not difficult after a little training, and there is no doubt that the fixation of a flap fitted like the door of a safe to the step-edged cornea by suture increased the safety of the operation in a great measure. It is known that, in the previous attempts to transplant the entire thickness of the cornea, a disc of cornea was merely placed in an opening made with a trephine. In the operation performed by Zirm, the disc was maintained by two cross threads stitched to the conjunctiva. There is certainly a great advantage in cutting and fixing the flap in such a way that the anterior chamber is tightly closed, and that no displacement of the graft can take place.

Thermophore Treatment of Corneal Lesions. Several years ago a series of experiments was undertaken for the purpose of ascertaining the effects of heat on different ocular tissues.

The first requisite for such experimentation was the devising of some means of passing accurately measured quantites of heat into sharply circumscribed areas of tissues for measured lengths of time. An instrument termed a thermophore was gradually evolved for this purpose, and by means of this instrument we can maintain masses of metal, termed conductors, at any chosen degree of temperature for any length of time. These conductors have surfaces, termed contact surfaces, of various areas, on their ends, and by holding these contact surfaces against the tissues to be treated, a definite and easily reproducable number of degrees of temperature can be passed into them for any definite number of minutes.

The original inspiration for this work was a desire to determine the thermal death point of intracorneal pneumococci. This was established at 152 to 158° F. applied firmly to the infected area for one minute, and is now a successful routine treatment of hypopyon keratitis with many surgeons.

During the experimental work involved in this it was early realized that different varieties of tissues had different thermal death points. The corneal epithelium was destroyed by 116° F. applied for ten minutes or 130° F. applied for one minute. Also 130° F. applied to the cornea for ten minutes or 140° F. applied for five minutes, would cause a permanent gray atrophy of iris tissues directly opposite the area of cornea heated, without permanent clouding of the cornea. Moreover, it was definitely established on more than forty glaucomatous eyes treated with the thermophore that the bulbar conjunctiva, sclera and cornea would stand 140° F. for five minutes without permanently harmful results.

Out of the mass of clinical and experimental information gradually acquired, the idea arose that succulent or new tissues growing upon the normal bulbar tissues might have a thermal death point below that of the normal tissues, and W. E. Schahan[5] has been conducting a series of experiments, using on the neoplasms a degree of heat already established as safe for normal tissues.

Growths upon the cornea and conjunctiva have been successfully treated by the author in this way. He states that the success of the treatment depends upon the fact that the thermal death point of epitheliomata, papillomata and other succulent neoplasms is lower than that of bulbar conjunctiva and sclera or cornea.

The particular attractiveness of the treatmtnt is that the temperature used (140° F. for from one to two minutes) is far within the limits of safety for other eye tissues. If therefore it is desired to treat a tumor, the nature of which is somewhat uncertain the treatment can be attempted, and if the tumor is such as resists the treatment, the patient is no worse off than he was before.

The treatment is more satisfactory than surgical treatment because the heat penetrates completely through the sclera and can be made to destroy every cell for some distance beneath the contact surface.

If some of the tumor is missed on the first treatment it is safe and easy to get it on a subsequent treatment. Also if there should be a recurrence it would be easy to destroy that.

The Relief of Partial or Complete Anterior Staphyloma. For the relief of partial staphyloma the end-result aimed at is twofold: first the removal of the deformity; and second, improvement in sight. The lat-

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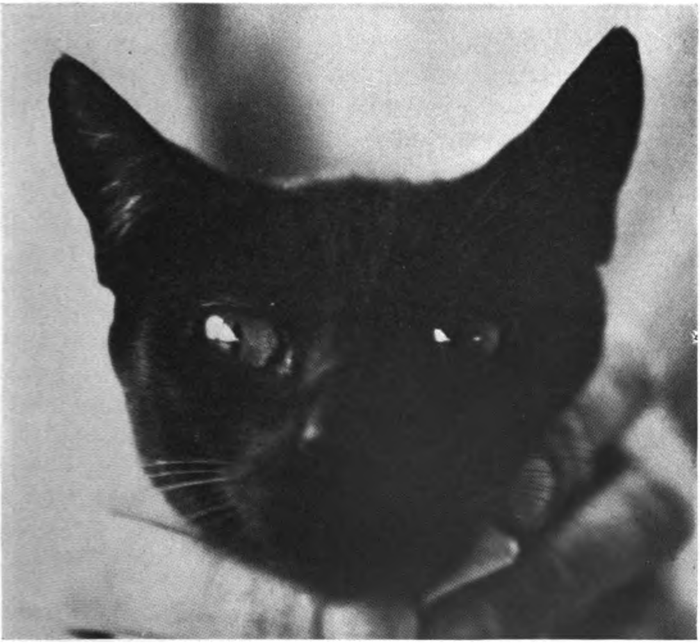
(5) Jour. Mo. State Med. Ass'n., November, 1921.

PLATE IV.



Right eye of cat operated upon. Photograph taken two years after the transplantation was made. The cornea appears normal. There is practically no difference between the cornea of the left eye and that of the right.—Ebeling and Carrel, page 58.

ter is gained by an iridectomy, usually and preferably, performed after the staphylectomy. In cases of total, or almost total, staphyloma, besides the removal of the deformity, the protrusion often being so great as to prevent closure of the lids, the object sought is also the retention of the globe within its orbit and the obtaining of a movable stump over which a prothesis may be worn. The operation of evisceration for such cases, while generally considered safer so far as future after-effects are concerned, and while it also leaves a better stump than enucleation, can not be compared in cosmetic results with a good operation for total staphyloma. Such an operation also does away with the necessity of insertion of a ball or other foreign body within the globe.

In considering any operative procedure in these cases, the nature and histology of a staphyloma must be borne in mind. Staphyloma does not consist of corneal tissue, but is really cicatricial iris tissue, the cornea having been perforated at some previous time, the iris filling the gap and eventually healing. In some cases, this scar tissue is extremely thin; in other cases, it is quite thick. It is necessary, according to A. S. Tenner,[6] in order to get healthy union, to remove all of this cicatricial tissue and obtain union between healthy or fairly healthy cut surfaces of the cornea. In methods of operation previously suggested, no definite statement is made as to the amount of tissue removed; but they seem to have been successful in obtaining a healthy flat scar.

In describing his method of operation, Tenner lays stress on the removal of all scar tissue and the insertion of the sutures in healthy tissue. The amount of tension on these sutures is very great, there is great likelihood of their tearing through the cornea. For this reason, a method of suturing, originally suggested by Wiener, was used. This consists of the use of gold strips 1.5 mm. wide, with holes large enough for the passage of the needle, 1 mm. apart.

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(6) Jour. Amer. Med. Ass'n., Nov. 26, 1921.

Such tension sutures are able to withstand almost any amount of pull. Ordinary black spool silk, such as is sold in the shops, was used. For light work, such as conjunctival suturing, black spool silk designated as *B*, and for heavies, such as tendon suturing, *D* silk, have been found generally satisfactory. It has found that *B* silk has a tensile strength of from 3¼ to 4⅛ pounds, the average in a long series being 3⅔ pounds. *C* is no longer made by the manufacturers.

Technique of Operation.—Preliminary Treatment: As many of these cases are already the subject of infectious processes such a trachoma or dacryocystitis, these conditions should be cleared up before staphylectomy is performed. In several of the cases in which operation was performed, a tarsal excision was first performed and the trachoma cured before proceeding to the main operation.

Anesthesia: General anesthesia is used in all cases.

Instruments: A speculum, Graefe knife, fixation forceps, pair of small strong scissors, mouse-tooth forceps, iris scissors, needle holder, needles, gold strips and black silk sutures, *B* strength, are required. A spatula and wire loop may be needed.

Description of Operation: The first step in the operation is the insertion of the sutures. A gold strip, a trifle longer than the long axis of the staphyloma, is prepared by passing double armed sutures through the holes. Then each needle is inserted at the limits of the protrusion through the cornea, emerging at the opposite limits of the staphyloma. This is not a simple procedure, because, owing to the opaqueness of the staphyloma, the needle is not visible in its course to the opposite side. However, it has the advantage of inserting the needles through a resisting membrane, whereas if the staphyloma is first excised and the needles inserted later, the cornea must be seized by an instrument, there is increased trauma, and greatly increased danger of extrusion of the vitreous. It may appear to be disadvantageous because of the danger of cutting the sutures in removing the staphyloma; but this is more fanciful than real. The second step is the insertion of a Graefe knife at one extremity of the staphyloma midway between the lines of sutures. The knife is inserted with the edge forward,

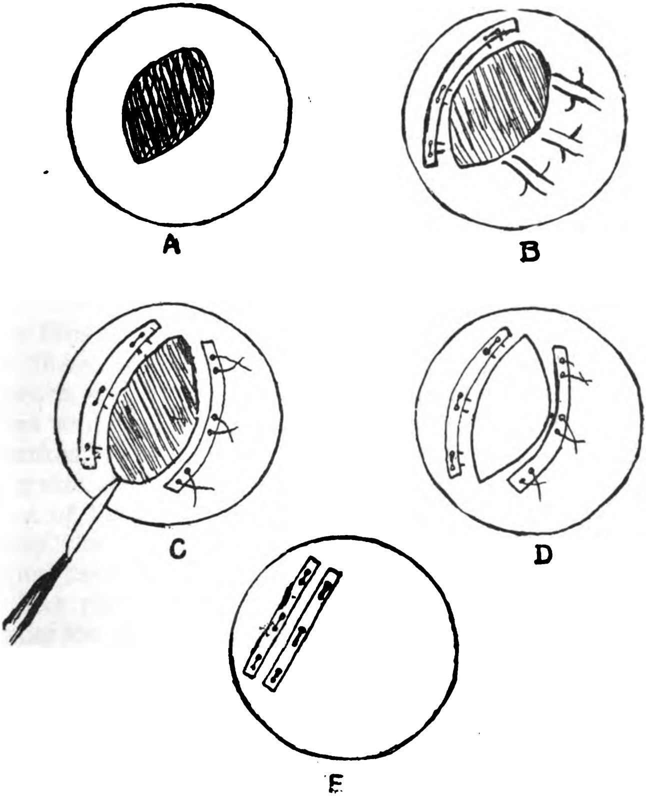

Fig. 7.—Steps of operation: A, shaded area representing staphyloma; B, suture inserted, with one gold strip in place; C, both gold strips in place, and knife at point of entrance; D, clear area representing excision of staphyloma, and E, sutures tied (Tenner).

passes through the long axis of the protrusion, keeping close to its under surface, and emerges at the opposite end. One lip of the wound is then seized by the mouse-tooth forceps, and with small scissors, such as the Stevens scissors half of the staphyloma is excised. The same procedure is followed with the other half. If the lens appears or extrudes, it is removed. The sutures are then tied over another gold strip. The performance of an iridectomy for improvement of vision is best postponed until after healing has occurred. Sutures are removed in eight days.

The steps of the operation are shown in Figure 7.

The Pupil in Health and Disease. The pupil is a part of the eye that is of prime importance not only as regards vision, but as a guide to diagnosis of local and general disease. H. V. Würdemann[7] calls attention to the more important pupillary changes that are observed in various general diseases, and are therefore of great significance to the general practitioner. The pupil is a portion of the ocular apparatus visible to the naked eye. The name pupil arises from pupus—boy, or pupa—girl, and probably arose from the miniature image of the observer mirrored by the anterior surface of the cornea.

When we talk about the pupil itself, we are really talking about nothing. It is simply a space, a hole in the iris, which in local disease may be blocked up or obscured by exudation or opacities of the media. There are thus no diseases *per se* of the pupil. When we refer to these, we consider chiefly the opacities back of the cornea, *i.e.*, of the anterior and posterior chamber, the lens and the anterior portion of the vitreous. As remarked, it is an aperture in the iris which is of varying size, depending in health upon the conditions of life and of light, or the depth of color of the iris, or possibly the amount of pigmentation in the chorioid and upon the age of the person.

The pupil appears black to ordinary observation because the illumination of the fundus by direct light is not sufficient to show the depths of the eye and what light gets in is absorbed, not reflected. Albinos' eyes have a red pupil. Cats' eyes shine in the dark.

Ordinarily in bright light the pupils are small and expand in dim light and darkness to almost the rim of the cornea. Dark brown or deeply pigmented irides are usually associated with a larger pupil than light gray or blue. There are no such things as 'black' eyes. The color of the iris varies from light gray to blue or very

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(7) Northwest. Med., May 2, 1922.

dark brown. In childhood the pupils are usually larger and more active than in age. In old persons they may be contracted even down to pin points and yet be normal. By the latter, perhaps, a certain degree of accommodation or at least sharpening of objects is obtained by cutting off the divergent rays of light.

The position of this aperture is not exactly in the middle of the iris. It is normally a little down and to the nasal side, corresponding very nearly with the optic axis, being between the corneal axis and the visual center, about five degrees between these points in the emmetropic eye. In the case of myopia or hyperopia and meridional astigmatism, these relations are decidedly changed, hence the great differences in the angles alpha and gamma.

Birds and omnivera have round pupils. The felines have perpendicular, and the herbivora longitudinal shapes. The pupils of snakes and reptiles are oval.

The pupillary action, the accommodation and its consensual reactions are of special importance. Every physician looks at the eye of his patient for almost any complaint. When the ciliary muscle accommodates to produce clear vision, it should leave the pupils equally contracted. The independent innervation of the ciliary muscle on the one hand and the iris on the other in certain conditions become disassociated. We, therefore, may have normal accommodation and normal pupil, or the opposite pupil contracted and fixed to light, or pupils dilated and fixed to light which contract when accommodation occurs. Its consensual reaction, *i.e.*, of one eye to the other, is important as a stimulus diverging to the pupil centers on the one side; has nerves crossing to those on the other side, and harmonious and equal contraction occurs. Even where one eye is blind, where the associated nerve fibers are not affected, the pupil contracts when light is cast into the other eye, but not when light is put into a blind eye will that of the other contract.

The relation to the pupillary reaction in diseases of the spinal cord or the brain are of great diagnostic and prognostic importance.

The entire sympathetic nervous system of the child and the youth is unstable as compared with the adult state. The structures of the iris are fairly resilient and hence there are quick changes in its action. In youth and adolescence the child lives in a world of make-believe, the imagination and the powers of inhibition are active, hence the relatively more dilated pupil. In old age, beside the dullness of the inhibitory functions, the iris being a vascular membrane becomes stiffened from sclerosis and hence its actions are slow and of not so great extent. Unstable functional nervous conditions, even though they be unassociated with disease, show marked variations in the pupil.

Normal pupils are influenced by (1) light and shade, (2) accommodation, (3) sensory stimuli, (4) emotions, (5) sleep, coma and death, (6) drugs, either locally, applied or internally administered, (7) diseases, especially cerebrospinal, nervous states and diseases, (8) various other conditions, (9) local disease and conditions of the eye.

In normal sleep there is ptosis, *i.e.*, closure of the lids, due to inhibition of the action of the sympathetic to the levator palpabrae muscles. There is also contraction of the pupil from inhibition of the dilator muscles of the iris by reason of the same condition, but when the person is awake with the lids closed the pupils are enlarged on account of cutting off the light reflexes and they contract as soon as they are opened. If the person remains asleep, there is no appreciable action on the pupil. The same conditions obtain in coma and low grade of narcosis induced by anesthetics.

At the moment of death, the pupils dilate, followed later by a partial contraction from setting in of rigor mortis, the pupil remaining mediumly dilated in what is called the cadaveric position, midway between the normal pupil and that of paralysis of the sphincter muscle of the iris. In narcosis by chloroform or ether the pupils are at first contracted, but at the moment of total loss of inhibition, which is a warning sign to the anesthetist, the pupils dilate.

The pupillary symptoms of disease are well marked and are distinctive. Of special interest are the effects produced on the pupil by local diseases. As remarked, the normal juvenile pupil is usually somewhat large and varies greatly in size. It is usually approximately round, but when fully contracted it will be seen that it does not occupy exactly the center of the cornea.

The effects of eserine, pilocarpine and morphine locally contract the pupil to a pin-point size. The same effect is also produced by adrenalin solutions, whereas atropine, scopolamine or homatropine and a few other remedies completely paralyze the constrictor muscles as well as stimulate the dilator muscles of the iris. These drugs taken internally produce the same result when enough of the medicine has been absorbed to affect the peripheral nerve supply of the iris.

The size of the cadaveric pupil is less than that produced by mydriatics, and that of the paralytic pupil, where the contractors and the dilators are not stimulated, is between these two. In a few cases the front of the eye is all pupil, *i.e.*, when there is a total absence of the iris or aniridia.

The anterior chamber and area of the pupil may be filled or partly filled by transudates as hemorrhages, producing hyphema or by exudates as hypopyon. During iritis exudates are thrown out and gum the margin of the iris to the anterior capsule of the lens, producing posterior synechia, which may be partial or complete, the latter being called exclusion of the pupil. All cases of iritis, no matter how little, if existing for several days will result in synechia. If the pupil can be fully dilated by atropine, this will be drawn away, leaving some of the posterior layer of the iris which is the pigmented layer on the anterior capsule of the lens. If the pupils be entirely filled up with exudate, they may form a dense membrane.

The pupil in glaucoma is usually moderately dilated and irregular, being commonly of an ovoid shape. There is sometimes a greenish reflex here to the edge of the iris and usually advanced, rendering the depths of the anterior chamber less, and in some cases the iris lies across Descemet's membrane. Transillumination of such an eye will show that the circumlental space is very much constricted, showing that the base of the iris is likewise pushed forward.

Differences in the shape of the pupil may be caused by traumatism, surgical operations, congenital affections and disease. Marginal or radiating tears of the iris or detachment of the base of the iris (iridodialysis) distort the pupil; in the latter the edge of the lens is distinctly visible. There may be several pupils (policoria).

The Diagnostic Value of Pupillary Symptoms in General Diseases. M. L. Foster[8] outlines briefly the diagnostic value of certain pupillary symptoms, for the benefit, more especially, of the general practitioner, who, strange as it seems, fails in many cases to profit by what these conditions would show.

The pupils are ever changing in size because of the varying conditions of light and accommodation, but we can recognize at a glance whether they are abnormally large or small, and whether they are equal in size. We can also appreciate the fact when pronounced changes have taken place in them without apparent cause. We must know how to test the reactions of the pupils to light and to convergence or accommodation, and be ever ready to make these tests when attention has been called to the eyes. These tests are very easy to make. Cover the eyes for a few moments to accustom them to the dark and allow the pupils to dilate; then cast a bright light into one eye and observe the contraction of both pupils.

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(8) New York Med. Jour., Nov. 16, 1921.

The contraction of the pupil through which the light is cast is called the direct, that of the other pupil the indirect or consensual reaction to light. Both must be observed because sometimes the consensual is present when the direct is not. To test the reaction to accommodation or convergence, either name may be used indifferently, have the patient look far away into the distance, then have him focus his eyes suddenly on a finger held four or five inches away directly in front of them, and watch the pupils contract. No matter whether the pupils are dilated, contracted, or unequal, no diagnosis can be drawn from their condition without taking into account these two reactions, together with whatever other symptoms, either local or general, may be present.

Let us suppose that both pupils of a person apparently in fair health are widely dilated. The cause of this mydriasis may be in the eye itself, in the body at a distance from the eye, or it may be psychic. If the person is totally blind, neither pupil will react to light or to accommodation, and some explanatory lesion exists in the eyes. This lesion, when found, may prove to be a symptom of some past or present organic trouble in the central nervous system, or it may be purely local. If both pupils respond directly to light, neither eye is totally blind. If vision is good for distance, but bad for near and there is no reaction to light or to convergence, we must have the patient look in various directions and observe whether any of the muscles which move the eye up, down, or inward are paralyzed, for this combination of symptoms would indicate an affection of the oculomotor nerve, quite likely due to a lesion in the brain. Should these muscles function normally, we have to investigate whether the mydriasis dates back to a traumatism which ruptured the sphincters of both irides, whether by some chance a cycloplegic has been instilled into the eyes, and whether the patient has recently recovered from a sore throat. When the last-mentioned possibility proves to be the case, a diagnosis of post-diphtheritic paralysis is pretty safe. If the pupils react to accomodation, though poorly or not at all to light, the presence of tabes is strongly suggested, but it must be remembered that the patient may possibly be suffering intense pain, or may be under the influence of strong emotion, such as fear or anger, may have some psychic trouble. The reflex mydriasis induced by powerful and psychic stimuli may be so strong as to be able to overcome the contraction of the pupils induced by the strongest light we can employ, so an absence of the light reaction in patients thus suffering does not necessarily indicate the presence of an organic change in the central nervous system. When the reactions to both light and accommodation are prompt we need to question whether the sympathetic nerve may not be irritated by some lesion in the neck, or mediastinum. In a child, the cause may be intestinal worms. When a patient is very ill or unconscious, the presence of mydriasis is not likely to be of much diagostic value.

The opposite condition, myosis, may be due to inflammation or irritation of the eyes, which is usually evident, or to instillation of some miotic like eserine or pilocarpine. When the pupils are equally contracted, we are likely to think of chronic poisoning by opium or one of its alkaloids, the patient being supposedly in fair health, but the contraction may have been caused by a ciliary spasm following near work, by hysteria, or by paralysis of the sympathetic nerve. Should the reaction to light be lost and the pupils contract still more in accommodation, the cerebrospinal system is affected and tabes should be considered.

It goes without saying that if one pupil alone is dilated or contracted, the pupils must be unequal. Therefore, inequality of the pupils should not lead to a hasty diagnosis of tabes. If one pupil alone is dilated and responds consensually but not directly to light, we know that eye to be blind, although the reaction to convergence is normal. If the eye is not blind and the dilated pupil refuses to react to light, either directly or consensually, or to accommodation, we have to investigate with regard to a past traumatism, an instillation of a cycloplegic, and an intracranial lesion. If it reacts to light, we think of a possible lesion that irritates the sympathetic on the same side, or involves the oculomotor nerve. When one pupil is contracted with no explanatory irritation or inflammation of the eyes, and when no drops have been instilled, or when both pupils are contracted to an unequal degree, our first thought is of tabes, but this is not present if the pupils respond to light in a normal manner. In the majority of cases the light reaction will be found to be either slow or abolished, and then we know that there is trouble in the central nervous system. In rare instances unequal pupils with normal light reactions are congenital and physiologic, but we should not permit ourselves to make this diagnosis until after every possible affection of the sympathetic nerve has been excluded. Sometimes the cause of such an anisocoria in a child may be found in a swelling of the bronchial glands on the same side with the larger pupil; and, as such swellings are usually tuberculous the anisocoria in those cases may be said to be an early symptom of tuberculosis.

The reactions to light and accommodation may both be slow or abolished at the same time. The pupils are then usually dilated. Such a condition may be caused by a lesion situated in the sphincter of the iris, in the short ciliary nerves, in the ciliary ganglion or its motor roots, in the trunk of the oculomotor nerve, or in the ganglion cells of the nucleus of the sphincter. We can get some assistance in locating the lesion by the instillation of a drop of eserine into the conjunctival sac; if the drug produces its ordinary effect on the pupil, the lesion lies farther back than the ciliary ganglion, while if its effect is slighter than it should be the lesion is either in or in front of this ganglion. This absolute immobility of the pupils is met with in cerebral syphilis, occasionally in general paresis, less often in tabes.

More frequently we meet with the reflex immobility of the pupils, in which they react slowly or not at all to light, either directly or consensually, although they respond promptly to accommodation. This is the Argyll Robertson pupil. The pupils may be dilated, contracted, or normal in size, equal or unequal. Their predominating peculiarity has just been stated, but they also fail to dilate in response to sensory and psychic stimuli. Such a condition leads us at once to search for other signs of tabes, but it is not absolutely pathognomonic of this disease. It occurs occasionally in general paresis, and is said to have been met with in some other cerebrospinal diseases. The pupils often are irregular, and sometimes the iris becomes atrophic with a consequent weakening of the reaction to accommodation; in such cases the pupils simulate more or less closely the condition of absolute immobility.

Once in a great while the attention may be arrested by queer behavior on the part of the pupils. First one and then the other will dilate and contract from no apparent cause, or they may dilate and contract together. The first is called alternating mydriasis, the second hippus. Both symptoms are indicative of trouble in the central nervous system, but they may be passed by along with various other reflexes of the pupil which have been the subject of considerable study, but are as yet of little value in diagnosis.

We must admit that the behavior of the pupils, taken by itself, is an unreliable guide to diagnosis. The pupils may be dilated, contracted, or normal in acute and chronic alcoholism, as well as in other kinds of poisoning, and their reactions may be increased, decreased, or not affected; their condition depends on the quantity of the poison taken, the nature of its action, the stage of its action when we happen to see the patient, and the latter's susceptibility. The same uncertainty of pupillary behavior exists in meningitis, most intracranial troubles, psychoneuroses, and many other diseases. Nevertheless, observation of the pupils, when taken in conjunction with the other symptoms present, frequently proves a very valuable aid in the diagnosis of general disease.

Aniridia. One of the most interesting of all congenital defects is that of aniridia or congenital absence of the iris. It is in this condition that hereditary tendency in its relation to congenital defects most prominently reveals itself.

Aniridia, observed clinically, is apparently a complete absence of iris; but all reports made upon histologic section of aniridic eyes state that a vestige of iris is present.

The theories advanced are as follows in outline:

1. Intra-uterine inflammation of the eye (von Hippel and Rindfleisch).

Causes of disproval: (a) By far the majority of cases are bilateral; (b) there is a strong tendency to transmission.

2. There are a number of theories based on congenital or embryologic factors, as the absence of the anterior ciliary vessels (Arnold). But others, especially von Hippel, state that the anterior ciliary vessels supply the anterior vascular sheath of the lens and not the iris.

Sichel calls it a congenital mydriasis, which explains nothing. Manz thinks that the inward growth of the iris is mechanically interfered with by the prolonged contact of the lens with the cornea during intra-uterine life. Hess and Coats believe that the condition is due to a hyperdeveloped or over-vascularized mesodermal tissue not giving way to the iris as it presses in.

Symptoms and conditions sometimes met with are:

ptosis, microphthalmus, deep anterior chamber (rarely is the anterior chamber shallow), persistent pupillary membrane, complete absence of suspensary ligaments, opacities of the vitreous, atrophic chorioidal spots, detachment of the retina, and persistent hyaloid artery.

In a case reported by Lyle,[9] in addition to the aniridia there were also microphthalmos, ptosis (Plate V), lamellar cataract, posterior corticular cataract, esophoria, myopia and amblyopia.

Traumatic Aniridia. This is of such rare occurrence that any reported case is instructive. W. B. Hunter[1] reports the case of a man whose eye was injured by a piece of glass.

His left eye looked as if a large black sloe or cherry were occupying the place of the pupil or anterior surface of the globe seen between the eyelids; on the right side was a normal eye with a hazel grey iris; the anterior chamber of the left eye was full of blood, which extended all around to the edges of the sclerotic and all over the posterior surface of the cornea. There was complete blindness of the eye, and no red reflex could be obtained by the ophthalmoscope. The patient, who said that he felt no pain in the eye, stated that some hours previously a piece of glass had entered the eye and had been pulled out.

The eye was douched and cleaned with a warm boric acid lotion and examined. There was a small insignificant closed and clean wound at the sclerotic margin of the cornea; there was nothing in the wound nor protruding from it, but the iris was completely absent. A drop of solution of atropine was instilled, to give perhaps some rest to the eye, which was then bandaged and the patient put to bed. During the two weeks taken for the absorption of the blood and clearing up of the parts no pain was experienced and there was no reaction or inflammatory trouble, showing that there

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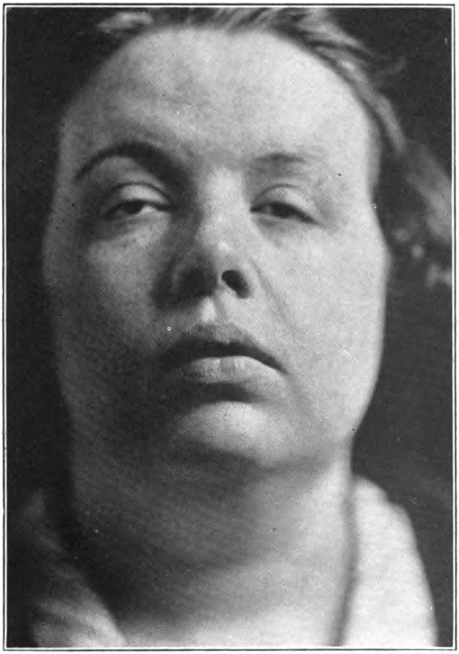
(9) Cincinnati Jour. Med., April, 1922.
(1) Brit. Med. Jour., Nov. 19, 1921.

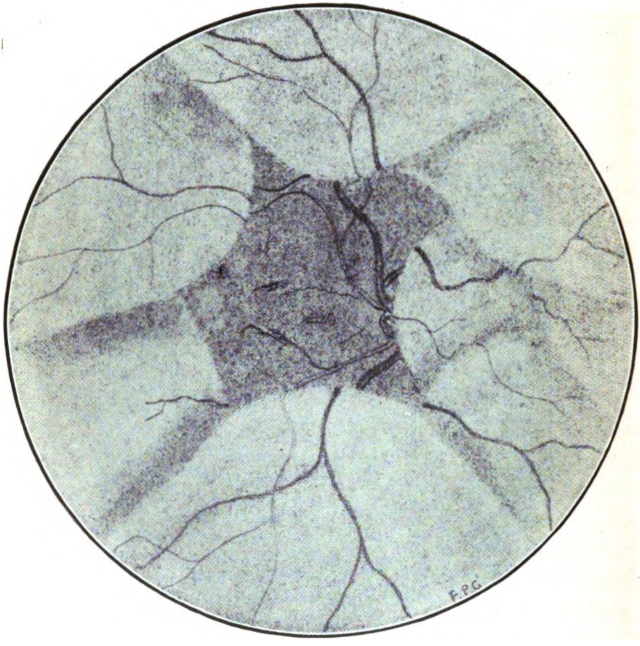
had been no sepsis, and that the ciliary body had escaped injury. With and without the aid of the opthalmoscope the ciliary body could be seen beautifully all around with its normal anatomic attachments and with no irregularity in its contour. The whole of the fundus was in a healthy and normal condition. There was no escape of vitreous and the lens was uninjured. The sight was good for distance and large print could be read. No trace of iris could be seen in any of the chambers, so that it must have been drawn out with the piece of glass through the small wound. That the aniridia might have been congenital was, for obvious and various reasons, after investigation, completely negatived.

PLATE V.



Aniridia.—Lyle, page 78.

PLATE VI.



Charcoal drawing of the right fundus, illustrating the globular detachment of the retina.—Calhoun, page 97.

The Etiology of Primary Cataract. Despite the fact that primary cataract has a strong personal interest for so many of us, its causes have been, and still are, veiled in a mist of uncertainty which all our efforts have failed to pierce and which even now shows little signs of lifting. Excluding forms of cataract caused by purely local conditions, such as those varieties which follow trauma, detached retina, intra-ocular tumors, retino-chorioïditis, and inflammatory exudations on the lens capsule, or such as are due to developmental defects in the lens vesicle, and including only those progressive and non-progressive forms which may be considered to be primary in nature, H. Kirkpatrick[3] states that mid the general obscurity certain known facts stand out clearly. These are:

1. *A cataract is the result of a degeneration of the fibers or cells of the lens:*

This degeneration may be due to a cause which is active for a limited period only. In this case the cataract is likely to be non-progressive—for example, punctate cataract, lamellar cataract, etc.

2. *Primary cataract is nearly always bilateral:*

This indicates that the cause of the disease must be sought for in some constitutional and general change or defect.

3. *Certain conditions are generally admitted to predispose to the development of cataract:*

Senility, diabetes, pellagra, the ingestion of certain poisons, and rickets are the most prominent of such conditions; but cholera, gastro-intestinal disturbances, focal infections, and debilitating general conditions are considered by many to be factors in the causation of cataract.

4. *An hereditary predisposition to the disease exists:*

The lens cells of some persons, therefore, suffer from

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(3) Brit. Med. Jour., March 25, 1922.

an inherited susceptibility to certain noxious influences, or the organs and tissues of their bodies inherit a defect which allows disturbances in their function to occur with unusual facility; such disturbances injuriously affect the nutrition of the lens fibers.

5. *Convulsions of the type found in tetany have frequently been followed by the development of cataract:*

The observations of Noël Paton and Findlay suggest that tetany is due to a defective action of the parathyroid glands; these ordinarily detoxicate a guanidine compound derived from muscular metabolism; tetany occurs if this process is interfered with. Fischer and Triebenstein claim to have found evidences of tetany and latent tetany in 88.2 per cent. of cases of senile and presenile cataract, whereas such evidences were only found in 8.3 per cent. of control cases free from cataract.

6. *Cataract has been observed to follow the removal of the thyroid, either for experimental purposes or for surgical reasons:*

Thyroidectomy is not, however, always followed by cataract, and, assuming the operation to be complete, some additional factor must be present to cause the disease in such cases. In this connection it must be remembered that it may be difficult to avoid injury to or removal of the parathyroids in the execution of a thyroidectomy. The writer has seen cases of cataract associated with hypothyroidism, the history and course of which strongly suggested that the ocular condition was dependent upon deficient endocrine function.

7. *Excessive glare may be a contributing cause of cataract:*

A peculiar form of slowly progressive cataract is found amongst bottle-makers and furnace workers. Its frequent occurrence among such workers suggests that the rays which emanate from a furnace may, in some cases, be capable of inducing a degeneration of the lens fibers, the fact that they do not invariably do so suggests that additional factors, possibly of a constitutional nature, may be present in those workers who become affected by the disease.

8. *Cataract occurs more commonly in India than in most other countries:*

After making due allowance for the fact that the proportion of competent surgeons to the size of the population is small, the vast numbers of cases of cataract dealt with by individual surgeons in India leads one to the irresistible conclusion that the disease is extraordinarily common in that country. The great number of persons, blind from cataract, met with on the roads and streets is confirmatory evidence. All classes of the native population appear to be affected, but the disease seems to be more prevalent among the poorly fed lower classes than among the well-to-do. Cataract also seems to be most common in the hotter, drier, and more arid districts.

While it must be admitted that it is not possible to state with certainty the cause of primary cataract, the following conclusions appear to be legitimate:

1. The cause of primary cataract is probably a constitutional one.

2. Most of the morbid conditions which are associated with the development of primary cataract, injuriously affect the actions of the endocrine glands.

3. Primary cataracts sometimes follow thyroid and parathyroid deficiencies, and are almost certainly then caused by a disturbance of endocrine function.

4. Exposure to injurious heat and light rays, and the existence of uncorrected errors of refraction are likely to determine the formation of a cataract in the eye of a person who is predisposed to a degenerative change in his lense fibers by a constitutional defect.

Section of Secondary Cataract with Graefe Knife. Duverger(5) refers to the inconveniences and dangers of extraction and discission. He thinks that section with a good cutting instrument such as the Graefe knife obviates the disadvantages of the other methods, and he has for a long time employed it for discission of secondary cataracts. The operator standing behind the patient holds the eye steady by the forceps held in the left hand. The knife in the right hand punctures the cornea 2 mm. in front of the limbus at the superior extremity of the vertical diameter. When the point of the knife appears in the anterior chamber the handle is lowered to view the opposite pupillary edge and the knife is pushed until its point touches the membrane beneath the pupillary edge; the membrane must be transfixed with the point of the knife. If this maneuver is not correctly performed there is a risk of pushing the membrane into the vitreous or of dragging it from its insertion without sectioning it, when the membrane is transfixed by the knife point which penetrates about 5 mm. in the vitreous. The membrane is then sectioned by a series of saw-like movements of the knife. These saw movements are necessary to avoid traction on the zonula and to section the membrane clearly at the chosen site following the principal vertical axis of the pupillary field. The result is a vertical slit the lips of which open by degrees under the pressure of the vitreous which herniates into the anterior chamber, and the natural retraction of the membrane. The knife is usually withdrawn without the loss of a drop of aqueous humor. Care must be taken while sawing the membrane not to section the limbus and sclerotica.

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(5) Archiv. d'ophtal., August, 1921.

Loss of Vitreous, Prolapse of Iris, and Subsequent Membrane Formation in Cataract Operations. In the Major Smith operation the escape of vitreous is generally a result of having to rupture the ligament in order to extract a cataract in its capsule. The improvements in this operation that have recently been reported should make it more popular as it is certainly the ideal operation if loss of vitreous can be avoided.

S. McAllister Payne[6] shows how faulty technique is

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(6) New York Med. Jour., April 19, 1922.

the cause of loss of vitreous. To eliminate such loss and prolapse of the iris he recommends the following technique:

Patients are not spoken to except to let them know that the operator is present.

The eye is thoroughly cocainized, the face and eye are made sterile; a wet bichloride towel is placed around the face and head; a speculum is placed under the lids, care being exercised not to open the lids uncomfortably wide. The fixation forceps are taken in the left hand, with the spring catch on the thumb side of the hand so that the thumb can reach the catch when ready to be removed. The eye is directed vertically and must not be pressed down any more than is possible to steady it. The knife is placed on the first and middle fingers far forward, so that the knife may be passed across without having to shift the fingers. With the fingers practically straight, the thumb is placed on the handle, and the knife is brought up to the limbus on the horizontal plane. Before entering the cornea at the limbus the handle is lowered slightly so that when the point of the knife passes through the anterior chamber the point is slightly higher than the handle. The point is lowered to the horizontal plane after it passes the dilated pupil, so that it will come in contact with the limbus. While the point is at the limbus ready to make the counterpuncture, make sure that the point is not low enough to engage the conjunctiva, because it handicaps the first upward and forward stroke, and may throw the stroke below the limbus, besides slowing up the stroke and endangering the iris. It is better to make the counterpuncture above the limbus than to engage the conjunctiva as the upward-forward stroke brings the blade into the limbus. For this reason, it is better to have the point slightly raised as it passes across.

The next stroke is backward and upward. These two strokes nearly complete the section, which avoids the danger of cutting the iris, so long as the edge is not turned downward at the finish. The strokes at the finish are short. The knife is passed along the line of the limbus, except perhaps the counterpuncture may be higher. The cut is finished with a conjunctival flap of about an eighth of an inch. The forceps are removed in less than a second by touching the catch with the thumb. The springless speculum is released almost as quickly as the forceps are removed.

The cystotome is taken in the right hand and the counter spoon in the left. The spoon is placed exactly in the position as in the cataract extraction: the handle across the nose in the left hand, on the eyeball just above the cut. The free margin of the lids is just as thoroughly cocainized as the eyeball, and the patient does not feel the counter spoon. The spoon does not leave its contact with the eyeball in its passage upward against the free margin of the upper lid. The cystotome is passed in from the temporal side at the temporal angle of the section. The capsule is cut; the cystotome is removed and put aside for the horn spoon. While this change is being made, the counter spoon may remain holding up the lid, or be removed until the horn spoon is in hand. As the counter spoon again holds up the upper lid, the horn spoon is placed on the flat against the free margin of the lower lid, while the edge is against the lower margin of the cornea. As soon as the slightest pressure is made the lens is tipped forward above; the lens comes out easily and quickly without the slightest strain on the ligament. If there should be soft cortical substance remaining, it can easily be removed with the two spoons in the same position as in removing the cataract, except that the horn spoon may have to follow up the soft lens matter as it comes forward. If the soft cortical matter can not be removed entirely in this way, the horn spoon is changed for the pipette with a normal salt solution.

Pupillary membranes are the result of a mild or severe iritis. This iritis usually comes from bruising the iris. Many pupillary membranes will disappear if left alone until the eye gets entirely well, that is, in from six weeks or two months. One of the reasons why patients may have to be needled more than once is that they have been needled before leaving the hospital when the inflammatory process was still going on, and the membrane has formed again. Another reason for needling more than once is failure on the part of the operator to cut the membrane. The use of a straight knife needle is often responsible for this failure to divide the membrane. The needle penetrates the membrane but, being too short to permit of moving the blade up and down, the blade is brought forward against the membrane, which is so elastic that it recedes from the blade to the edge of the iris, When the knife is removed, the membrane falls back in place uncut.

After witnessing so many failures several years ago, Payne devised a knife with a blade set at an angle of thirty degrees from the shank and handle. As the handle is held in the hand at an angle of about thirty degrees, the blade would lie on the horizontal plane. The point turned from the operator as it enters the anterior chamber when passed over the dilated pupil, a quarter turn toward the operator brings the cutting edge on the horizontal plane against the membrane, without the point entering it. A slight pressure and drawing the blade across the membrane at the same time will not fail to pierce it.

The Intracapsular Treatment of Cataract. Lt.-Col. H. Smith[7] says that about 25,000 cataracts are operated on each year in India by the intracapsular method, and that ten years hence another 10,000 may have to be added. India will have a voice in the decision between the intracapsular extraction and capsulotomy. The intracapsular method has come to live and dominate its opponent in the whole East and in Smith's opin-

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(7) Texas State Jour. Med., May, 1922.

ion it will come to be the operation the world over twenty years hence.

J. O. McReynolds[8] analyzing the results of the intracapsular operation in North America says that it presents the nearest possible approach to the ideal operation if successfully performed; that it is possible for the American surgeon by diligence and experience to acquire the requisite skill; that the American patient is entitled to the best that modern science can provide; that the operative dangers encountered are not greater in competent hands in the intracapsular than in the extracapsular method and that the process of healing is immeasurably freer from complications; finally, that the economic value is of the utmost importance to the individual and the State.

W. A. Fisher[9] points out the precautions necessary to avoid accidents in the intracapsular extraction, based on his experience of over 1,000 such extractions. These precautions include strict sterilization of instruments; the presence of a reliable assistant; the eye to be operated upon should be free from inflammation, with normal tension and perception and projection good; all kinds of specula should be discarded and the lids held by lidhooks; a small iridectomy should suffice. In order to prevent the loss of vitreous, which is the most serious complication that can occur, Fisher's needle may be used advantageously when the lens refuses to be delivered following safe pressure. Following operation the lids should be covered with a 2 per cent. yellow oxide of mercury ointment and a light dressing without pressure. As a rule inspection of the eyeball in less than nine days is not only unnecessary but detrimental, and only if the patient complains of severe pain that can not be otherwise relieved. It is usually not necessary to confine these patients to bed for a period longer than twenty-four hours. A patch

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(8) Texas State Jour. Med., May, 1922.
(9) Ibid.

should be worn over the eye as long as light irritates it. The first dresing should not usually be made before the third day but the lids should not be opened. Infection is rare when the operation is done on a clean eye. Success in these operations depends upon the competency of the operator and those attempting it should first perfect their technique on the eyes of the lower animals.

Electric Cataract. A Tiscornia[1] describes the occurrence of bilateral cataract in a girl of 13 years after having been rendered unconscious by lightning. There were no burns or other disturbances, only congestion in the eyes and photophobia for about two months. The cataract did not develop till a year later. Both cataracts were removed. Tiscornia has found twenty-nine similar recorded cases, lightning being the responsible agent in ten and ordinary electric currents in the others.

J. Stroebel[2] recommends that an electric cataract should be removed as early as possible as this will give a usable eye when the cataract starts in the second eye. In one case described by him the electric cataract developed in both eyes in three weeks; in another the interval was six months in one eye and two years in the other.

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(1) Rev. de la Ass'n. Med. Argent., August, 1921.
(2) Schweiz. med. Wochenschr., July 28, 1921.

Sarcoma of Chorioid. C. C. Maupin[1] emphasizes the importance of recognizing underlying conditions in blind eyes, as the following case reported by him shows.

The patient was a man, 61 years old, presenting the following condition of his left eye: Pronounced cataract, increased tension of the globe, attachment of the iris to the lens, left eye slightly larger than the right, no perception and no projection of light.

He had been exceptionally free from disease and had no specific history. His vision began to fail four years previously. At that time he had some pain which probably accounted for the iritis formerly present and leaving the posterior synechia.

Upon tapping the globe with the index finger the man experienced no discomfort. Exerting moderate pressure upon the globe between the two index fingers he complained of dull pain, which he said he had suffered more or less constantly, but it was somewhat increased on pressure. Similar examination of the good eye produced no discomfort.

The increase in size of the globe plus tension, firm posterior synechia, absence of projection and perception of light, made it definite that no benefit could be expected from lens extraction. The eye was enuculeated and the patient made a normal recovery and accepted an artificial eye ten days later which he is now wearing with comfort.

The specimen was sent to the pathologic laboratory and the report showed it to be a melanotic sarcoma of the chorioid.

Melanoma of the Chorioid. Sarcoma of the chorioid usually originates near the optic disc and grows forward pushing the retina before it. It is exceedingly rare to find chorioidal melanomata not covered by retina or retinal vessels. An exception to this general

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(1) Kentucky Med. Jour., April, 1922.

rule is illustrated in a case described by A. E. Keown.[2] The laboratory findings of the enucleated eye were as follows:

"The section shows a chorioidal malignant growth which is a melanoma. The origin of the pigmented cells from one original pigmented layer of cuboidal cells is very well seen."

The division of the eyeball into two nearly equal halves shows the origin of the tumor by a narrow base from the retina-free chorioid between the ora serrata and the ciliary body. It did not therefore necessarily cause retinal detachment, and it was not covered by retina. The growth bends back over the retina towards the disc pushing the hyaloid membrane in front of it (Fig. 8). In Haab's Atlas a melanoma is figured with an anterior origin but lifting the retina. In this case the retina can be seen in normal position. The microscopic slide shows typical cells, many of which contain much melanin.

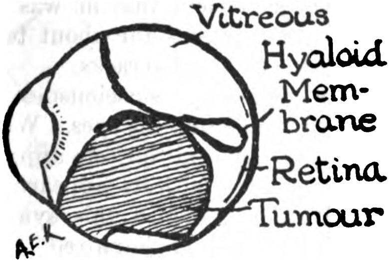

Fig. 8.—Melanoma of the chorioid (Keown).

The patient works with a powerful electric arc light suspended on his left and he has complained very much of the glare. He believes that the light had something to do with the causation of this trouble. The patient's opinion is of interest when one remembers the known effect of ultra-violet rays on the crystalline lens among men working in front of bright furnaces. The man is driving his stationary engine again. The stump is painless and can be rolled under the fingers. There is no enlargement of any abdominal viscus.

Hole in the Macula. Cases of hole in the macula

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(2) Lancet, Nov. 19, 1921.

have been reported in which there was no history of trauma, but associated with some other pathologic condition of the eye, such as ulcerative keratitis, uveitis, albuminuric retinitis, iridocyclitis, etc. It is probable, however, that all cases of hole in the macula are of traumatic origin. The following case reported by T. M. Li[3] is given here in detail, because up to this time, this is the only case on record in which a single injury produced a hole in the macular regions of both eyes.

While playing a game of soccer, a Chinese soldier was struck squarely on the face by the football. The force was so violent that he was knocked to the ground. He was unconscious for about ten minutes, and had to be carried to the barracks.

After regaining consciousness he experienced great difficulty in opening his eyes. When he finally succeeded in opening them, all objects appeared hazy and reddish. Two days later, objects appeared greenish to his right eye. Within a month this symptom disappeared, but his vision was much impaired. Instead of seeing green at the same time as his right eye did, his left eye saw many black lines and spots. In a few days these disappeared, and then objects appeared greenish to this eye also. As with the right eye, this symptom gradually disappeared during the course of a month, but his vision was very much impaired. Prior to the injury the vision of both eyes had always been excellent. His vision slowly improved for a period of about three months, but came to a standstill after that.

The following findings were noted: "Visiion R. = 6/20 and L. = 6/60. No lenses improved his vision. Tests by the retinoscope and ophthalmoscope prove his eyes to be practically emmetropic. External examination shows nothing abnormal. Both pupils are semi-dilated, the right being a little larger than the left. Both react somewhat sluggishly to light and accommodation. Consensual reaction is rather sluggish. Tension is normal in both

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(3) Amer. Jour. Ophthal., January, 1922.

eyes. There is no nystagmus or squint. With a Peters' campimeter, the right eye shows a relative central scotoma, oval in shape, with its long axis horizontal. Above, below and to the nasal side it extends to about 5° from the center; the temporal side to about 7.5°. The left eye also shows a relative central scotoma, slightly smaller than the right and more irregular in shape. Beneath this there is a relative paracentral scotoma, shaped like a small bean and somewhat larger than the central one (Fig. 9)."

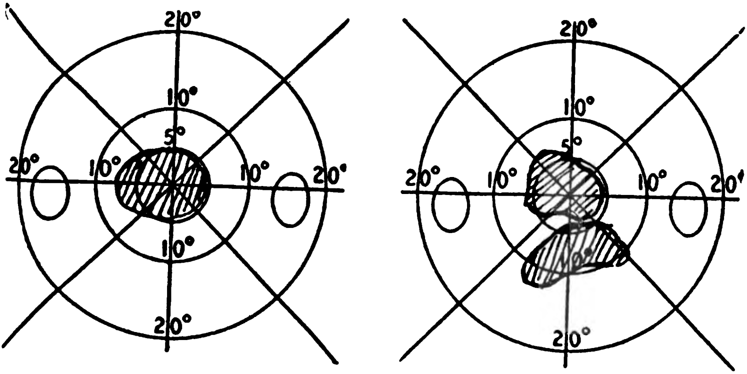


Fig. 9.—Diagrams of the relative scotomas, determined by Peter's campimeter. Obviously it was very difficult to map out these areas, since the central vision was affected; but after considerable effort and many explanations the result as shown above was obtained (Li).

Ophthalmoscopic examination showed the following: "R. the media are clear, disc almost round and slightly hyperemic, its margin sharply defined and regular, arteries normal, veins slightly engorged where they emerge from the disc. There is a thin film of grayish fibrous membrane covering a small area of the center of the disc. The fundus is normal with the exception of the macular region. A little more than two disc diameters to the temporal side of the disc, there is a dark red sharply defined oval area. Its long axis is practically horizontal, and its length is about two-thirds of a disc diameter. Its width is a trifle less than one-half of a disc diameter. This red oval area has a decidedly punched out appearance suggesting a hole. Within this hole, there are numerous small whitish spots of various sizes. Surrounding the oval, there is a hazy, reddish ring, which is of a lighter shade than the color at the bottom of the oval hole, but darker than the surrounding retina. Within this zone of red and close to the margin of the hole, with the exception of the upper temporal quadrant, there are numerous small, fairly round white spots. Immediately beneath the temporal end of the hole are several round yellowish spots. Beyond the outer zone of red, there are numerous fine whitish radiating striae. Between the disc and the hole, and about one disc diameter below the level of the two, there is a stippled area which measures about one-third disc diameter across. No floating opacities visible in the vitreous.''

Under the same circumstances, a Westerner would probably have a monocular involvement, since his comparatively high nasal bridge would very likely divert the direction of the ball away from one eye. If the force were very severe, he would probably have a fracture of the bridge of his nose in addition to a monocular injury.

No treatment except potassium iodide, 0.30 gm. thrice daily has been given. For three months following the first visit his vision slowly improved. On April 19, that is, at the end of two months, his vision was R. 6/20 and L. 6/20 minus 1. On April 29, his vision was R. 6/15 minus 1, and L. 6/20. On May 26, it was R. 6/15 and L. 6/20. The improvement in vision, which has probably come to a standstill, was quite marked in his left eye (Fig. 10).

Plates I and II represent the condition of the fundus of the eyes about four and a half months after they were first seen, or about one year after the injury. Numerous changes have occurred during this period.

The hole in the macula of the right eye was originally very much darker red in color; the white spots within the hole were much smaller and less numerous. The reddish ring surrounding the hole was narrower and less distinct. There were only three or four round spots surrounding the margin of the hole and they were much smaller and less distinct. The radiating striae were fewer and much less conspicuous than at present. The changes both within and around the hole of the left eye are the same as those of the right eye. The atrophic patch above the hole was not so white and extensive, but the areas of pigment were larger and less numerous. The several light yellowish round spots, a little above and to the nasal side from the hole, were not seen when the patient was first examined. All the changes are indicative of atrophy and fibrous contractions.

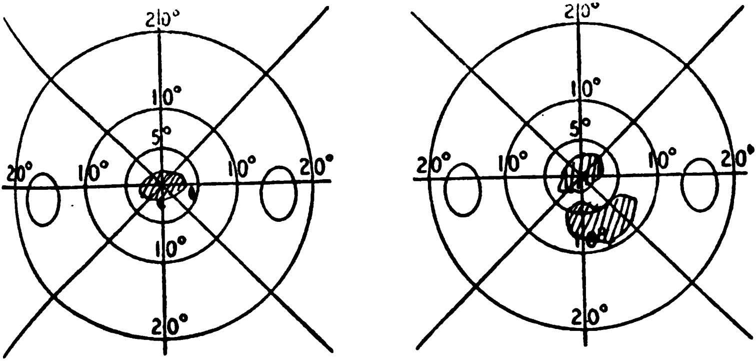


Fig. 10.—There was considerable diminution in the course of three months in the size of the scotomas as seen by the above diagrams (Ll).

The hole in the macula of the right eye involves the fovea centralis. In the left eye, the hole is below the fovea, which, however, is included in an area of degenerative changes involving both retina and chorioid.

‘‘L. Media clear, disc slightly vertically oval, a little hyperemic, margin regular and well-defined, arteries and veins normal. About two and one-half disc diameters to the temporal side of the disc and below the level corresponding to the lower margin of the disc, there is a dark red oval hole which looks exactly like the one seen in the right eye. The long axis lies in about the 165° meridian. This oval is a trifle smaller than the right. The same kind of a light red zone surrounds it. In the oval hole and around its margin there are also numerous fairly round yellowish and whitish spots. The former are generally smaller than the latter. A little above and a little to the nasal side from the hole, there are several light yellowish round spots. Immediately above the hole and extending above and to the temporal side there is a large whitish patch approximately twice the size of the disc. This area is stippled with numerous fine discrete pigmented spots. No floating opacities in the vitreous."

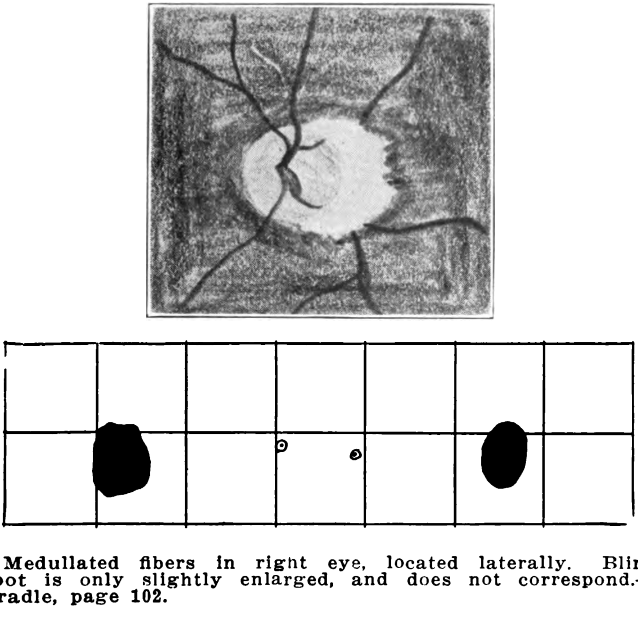
A blood Wassermann was performed and found to be negative. The urine was also normal.

With the history of a blow on the eye, the immediate impairment of vision, and the characteristic fundus picture, the diagnosis of hole in both macular regions was made. According to the patient's statement, the greatest force of the blow was received on the right side of his face, but from the fact that the vision of both eyes was immediately diminished, the cause of which is apparent from the damage seen in both macular regions, it is obvious that the blow must have struck both eyes quite squarely.

The Chinese, as a race, have a wide, low nasal bridge, and a low superciliary ridge. Their eyeballs as a rule are not so deeply set in the orbits as those of a Westerner; consequently they are not so well protected.

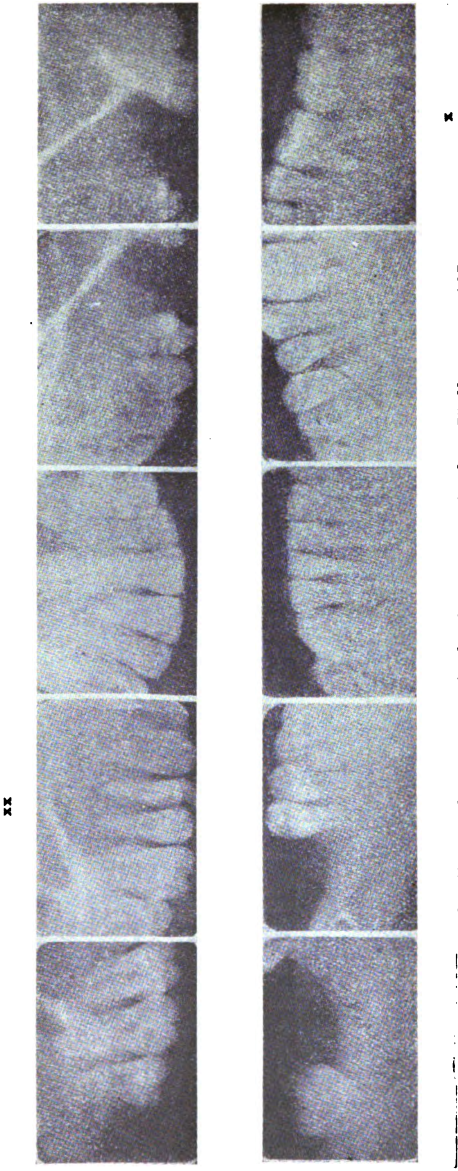
[The assertion that "all cases of hole in macula are of traumatic origin," is not accepted by various observers. The condition has been seen in the eyes of elderly people the subjects of arteriosclerosis, in retinitis pigmentosa, and in amaurotic family idiocy. The pathogenesis of this condition has not been clearly established, but edema or cystic degeneration of the ret-

PLATE VII.



Medullated fibers in right eye, located laterally. Blind spot is only slightly enlarged, and does not correspond.—Gradle, page 102.

PLATE VIII.



Radiographs.—x = Apical abscesses.—Archer-Hall, page 105.

ina, followed by destruction and absorption of the tissues at the macula is probably the cause of these so-called "holes."—C. A. W.]

Detachment of the Retina. Detachment of the retina in renal retinitis occurs with greater frequency than is generally supposed. The accompanying illustration (Plate VI) is from the case reported by F. P. Calhoun;[4] the patient was a young soldier who died of nephritis. The vision in each eye was for hand movements only. The external appearance was normal, except that the pupils were moderately dilated and reacted very sluggishly to light. The fundus of each eye showed an intense neuroretinal edema, with the outline of the disc completely obscured. The veins were sclerotic, causing venous compression. There were many small flame-like hemorrhages and exudates in the inner retinal layers, especially placed at the temporal side of the discs involving the maculae.

There were short intervals of improvement in vision and the fundus picture along with his general improvement, but always with a return of the intense edema and increase in the number of hemorrhages and exudates, until a few weeks before his death, when a flat detachment was detected in the upper part of each retina. Two days later, multiple globular detachments were seen in each eye, extending far forward to such an extent that they could be detected by oblique illumination.

Many detachments are undiscovered because they occur in severe renal retinitis toward the end of the patient's life, when ophthalmoscopic examinations are not generally made. Again, globular detachments are usually situated peripherally and are not looked for, whereas the retinitis is centrally placed and readily seen.

Calhoun refers to the valuable article by R. F. Moore[5], published in 1915, as Moore's experience has been un-

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(4) Jour. Amer. Med Ass'n., Oct. 15, 1921.
(5) Roy. London Ophthal. Hosp. Rep., 20; 262, 1915.

usual since he studied the cases of nephritis in the wards of St. Bartholomew's Hospital, London, for a period of two years. Calhoun quotes his deductions in part:

"Nephritis in the absence of retinitis is not a cause of detachment.

"The liability to detachment is largely proportioned to the severity of the retinal changes.

"The occurrence of detachment is not related to the presence or absence of general edema.

"The immediate cause of the detachment is an active subretinal exudate probably derived entirely from the retina.

"In the event of recovery of the patient reattachment occurs with permanent visual and fundus defects."

Detachment of the Retina, Probably Due to Exposure to Light During an Eclipse. There is perhaps no eclipse of the sun without its quota of damaged eyes. Cases of injury of the usual type were seen after the eclipse of April, 1921, despite the many warnings that appeared in the newspapers of the dangers of observation with the unprotected eye. An unusual case in which detachment of the retina of one eye occurred certainly as a sequel and probably as the direct effect of the eclipse exposure has been reported by N. B. Harman and P. MacDonald;[6] and it appears of sufficient interest and rarity to merit record.

After viewing the eclipse, examination of the eyes showed: Vision right eye was perception of light in the upper part (less than half of field). Vision left eye was 6/6 with a small degree of hypermetropia, about 0.5 D. The right eye showed a very extensive detachment of the retina, involving the whole of the upper half of the eye, and the detachment ballooned downwards so as to obscure the disc and macula, which could not be seen from a point which was estimated as being about one disc's breadth below the disc.

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(6) Brit. Med. Jour., April 22, 1922.

The point of greatest interest was the relationship between the patient's looking at the eclipse and the onset of the ocular trouble. He himself quite definitely assigned his looking at the sun as the origin of his visual defect. On first thoughts this view was not regarded with favor, but on reconsideration of his history of the onset of the disease in this case; of the fact that the etiology of detachment of the retina is not established; that a violent stimulation of the retina is known to be able to cause damage to the nerve elements of the retina; that it is not unreasonable to regard such violent stimulation as competent to set up an exudation behind the retina; that in this case there was a history of such definite violent stimulation; that exposure to light sets up exudation elsewhere—for example, blistering in sunburn—a diagnosis of retinal detachment due to excessive exposure to sunlight during an eclipse, seems justifiable.

The sequence of events in this case, may be fairly summarized as follows:

1. Severe damage to the macula consequent on exposure to sunlight.
2. A succeeding infiltration of the macular region.
3. Extension of the exudate in such quantity as to cause a gross detachment of the retina.
4. Absorption of the greater quantity of the fluid during the weeks of rest.
5. Exposure of the initial area of damage in the macula.
6. Onset of scarring in the macular region.

There are good grounds for believing that the majority of detachments succeed some injury or tear of the retina. In this case there was no such injury, unless it can be held that the damage to the macula consequent on the exposure constitutes a point of permeable tissue. It is much more likely that the accumulation of fluid behind the retina was an inflammatory collection—a suggestion to some extent supported by the gradual onset of the cloudiness of the vitreous some time after the detachment reached its full measure.

Albuminuric Retinitis. Volhard in 1916 connected the renal and retinal lesions as being the result of arterial ischemia, this ischemia being the primary and initial pathologic factor. Leber and others had previously accepted this view. R. Hanssen[8] does not admit this hypothesis, which he thinks is not supported by either clinical observations or microscopic research. The histologic lesions found are clearly inflammatory. The exudates in nephritic retinitis are always charged with albumen and fibrin which scarcely agrees with the idea of a purely passive transudation.

Hanssen has made a series of microscopic studies of the ocular globes of twenty persons attacked by marked general arteriosclerosis. The occular vessels were often normal while other organs were deeply involved. He also found that if inflammatory lesions existed in the ocular membranes they never were the result of a sclerosis pure and simple but of a complication especially renal; the toxic etiology can not therefore be excluded. Hanssen concludes that the pathogenetic cause of nephritic retinitis is not always the same. Very often the same toxin involves the kidneys and eyes at the same time, but sometimes the retinitis is due to products of dis-assimilation retained by diseased kidneys.

Nephritic Retinitis. Edema of the papilla, retinal edema and fibrinous exudates especially in the intergranular layer, accompanied by some hemorrhage, are the characteristic lesions of nephritic retinitis according to F. Terrien,[9] who thinks that importance should not be paid to vascular lesions. Contrary to the German point of view, he thinks that vascular lesions are inconstant and not sufficient to place nephritic retinitis in the rank of angiopathies. There are of course vascular le-

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(8) Klin. Monatschr. f. Augenh., August-September, 1921.
(9) Presse méd., Aug. 24, 1921.

sions but they are secondary. The renal and retinal lesions are not the result of the same cause, *i.e.,* alterations in the vessels; but it is the nephritis which, especially by the failure of the elimination of urea, causes the retinitis. However this latter view must not be generalized; while almost all patients attacked by nephritic retinitis show a greater or lesser quantity of nitrogen in the blood, yet a number of patients with severe nephritis do not show any appreciable retinitis.

The Relation of the Blind Spot to Medullated Nerve Fibers in the Retina. Since von Jaeger's first communication on this subject in 1855, it has been taken for granted that the presence of medullated nerve fibers, emanating from, or adjacent to, the disc was projected into the visual field in the form of an enlargement of the blind spot of Mariotte.

Landolt was the first dissenter from von Jaeger's point of view, and, in 1909, he advanced the assertion that the enlargement of the blind spot does not always correspond either in size or shape to the ophthalmoscopic picture of the anomalous nerve fiber condition.

H. S. Gradle[1] has been making a study of this condition for the past five years, using the tangential magnet scotometer for this purpose. As a result of his investigations he concludes that:

Medullated nerve fibers in the retina adjacent to the disc, as a rule, cause an enlargement of the blind spot, but that the enlargement of the blind spot found in such cases seldom corresponds in size or shape to the ophthalmoscopic picture of the medullated area.

The disparity between the size and shape of the blind spot and the ophthalmoscopic picture of the mass of medullated nerve fibers indicates that medullated nerve fibers within the retina are not opaque to incident light for the entire length of the medullation and that the degree of opacity can not be deducted from the ophthalmoscopic picture (Plate VII).

In such cases, the enlargement of the blind spot indicates merely the amount of retinal area that is prevented from functioning by the presence of overlying medullated nerve fibers in a layer sufficiently thick to occlude incidental light.

The term "opaque nerve fibers" is a misnomer and

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(1) Jour. Amer. Med. Ass'n., Nov. 5, 1921.

should be discarded for the proper term "medullated nerve fibers."

Optic Neuritis in Serum Sickness. The syndrome that follows the introduction of a foreign protein into the veins or subcutaneous tissues of a susceptible individual has been described by various authors under the heading of "serum sickness." These symptoms are usually of short duration and include fever, malaise, urticaria, arthralgia and occasionally slight general glandular enlargement. In the more severe instances of the disease there may be marked albuminuria and cylindruria, and the patient may lie in a semicomatose condition for days or even weeks.

It has been demonstrated by V. R. Mason,[2] from the study of three cases, that optic neuritis may follow this procedure. In order to establish with certainty, if possible, the causal relationship between the serum sickness and the optic neuritis with the associated changes in the cerebrospinal fluid, an opportunity was presented to examine the fundi of three patients with serum disease. The first patient was a child with epidemic cerebrospinal meningitis. The fungi were normal during the course of the disease. He was treated by intraspinal injections of antimeningococcus serum and recovered promptly. During the course of the subsequent serum sickness he developed a mild, bilateral optic neuritis without visual disturbances. The fundi soon returned to normal. The second patient was a colored woman, aged 38, who was admitted to the hospital with acute lobar pneumonia following delivery. The infecting organism was a Type I pneumococcus. She was given 300 c.c. of Type I antipneumococcus serum. Her fundi were observed daily during her illness. At the height of the serum sickness which followed treatment she developed ophthalmoscopic signs of a mild optic neuritis. The cerebrospinal fluid contained 12 cells per cubic millimeter and a heavy trace of globulin. She succumbed to a secondary

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(2) Jour. Amer. Med. Ass'n., Jan. 14, 1922.

infection of the lungs with hemolytic streptococci before the optic neuritis had disappeared. The third patient was a man, aged 25, with lobar pneumonia. On the third day of the disease, the patient received 200 c.c. of Type I antipneumococcus serum intravenously, and 100 c.c. on each of the three succeeding days. Thus, he received in all 500 c.c. of serum during the third, fourth, fitth and sixth days of the disease.

Ophthalmoscopic examination showed on both sides a well marked optic neuritis with at least I diopter of elevation of the discs. The disc margins were blurred, the cups were filled, and the veins were considerably distended. A small hemorrhage was present along the superior branch of the left temporal vein. The discs were pale. A pin-point exudation was present just below the right fovea. Both fundi were pale and had a peculiar yellow tint which was more marked peripherally, where there was moderate chorioidal blurring.

These three cases are believed to represent reactions on the part of the nervous system to the parenteral introduction of foreign protein into a susceptible individual. Since in each instance the urine was normal or contained only slight traces of albumin, it is improbable that the optic neuritis was dependent on renal impairment. It is also improbable that it was produced as a result of the general infection. Uthoff studied the records of 253 instances of optic neuritis during acute and chronic general infections, but encountered none that followed acute lobar pneumonia. Moreover, in the rare, recorded instances of optic neuritis subsequent to acute lobar pneumonia, permanent visual changes have resulted. The evidence at hand, therefore, favors the assumption that optic neuritis, combined with an increase of the cellular and globulin content of the cerebrospinal fluid, may occur as the result of the introduction of a foreign protein into a sensitive individual. It is possible, furthermore, that in some cases optic neuritis might be the only symptoms of hypersusceptibility to a food or other protein.

Optic Neuritis Resulting From Carious Teeth. That diseased conditions of the teeth may be the cause of optic neuritis, is illustrated by the following case, reported by H. W. Archer-Hall:[3] The patient had complained of headache and loss of vision in the right eye, during the last six days. Examination showed: R. V. = light perception; L. V. = 6/12. With ophthalmoscope: very slight optic neuritis, not enough to account for the blindness. The blindness seemed due to an inflammation of the optic nerve posterior to the eye, but extending forward so that slight inflammation could be discerned with the ophthalmoscope at the optic disc, and apparently due to a toxemia arising from some septic focus, but there was no evidence of sepsis in the accessory nasal sinuses or elsewhere.

On the following day the patient had become blind in both eyes. On casual inspection her mouth, generally speaking, appeared both clean and well cared for; there seemed at first very little chance of finding anything orally to account for her condition.

Radiographs (Plate VI) suggested definite evidence of apical trouble at the root of the upper left first bicuspid. There was a shadow at the apex of this tooth suggesting rarefaction, and the crown of the tooth was carious. The upper right first molar had recently been extracted. On clinical examination the radiographic evidence was confirmed, the upper left first bicuspid was found to be carious, very tender on palpation, and on tapping the tooth, an apical impulse could be distinctly felt, the pulp was found to be dead. Two other teeth very tender, and somewhat loose on palpation, were the upper left second bicuspid and the lower right first molar; on radiographic evidence the latter appeared normal; but the apex of the former suggested a very slight area of rarefaction and some evidence of apical absorption.

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(3) Lancet, April 1, 1922.

There was a slight amount of gingivitis in the area of the lower incisors, due to a small deposit of tartar, and the radiograph showed some alveolar absorption as a result of this. It was thought advisable to extract the two upper left bicuspids and the lower right first molar, and this was done under nitrous oxide. The lower incisors were scaled and the gingivitis soon cleared up. Examination of the teeth after extraction entirely supported radiographic and clinical evidence; there was some absorption of all apices, except in the case of the anterior root of the lower right molar which appeared to be normal.

On the following day, although only twenty-four hours had elapsed since the extractions, she said she felt better; vision amounted to the counting of fingers at one meter. Four days latter she could see the illuminated card bearing the test types at six meters, and eight days after removal of the three teeth, she saw the large top letter 6/60. With each succeeding week she read a further line of the test types, until she attained full fields of vision and perfect visual acuity, 6/6 with each eye.

Early Recognition of Glaucoma Simplex. The majority of cases of glaucoma are well advanced before they are recognized and then but little can be done to stop the inevitable blindness. H. C. Haden[4] says that a good deal of the blame for this is due to the lax methods of routine examinations made by ophthalmologists. There are many cases which do not show glaucomatous excavation of the optic disc until very late and the most usual diagnosis of these is primary atrophy of the optic nerve.

The fields will sometimes present the characteristic proportionate loss of form and color, and at other times the color shrinkage will be much out of proportion to the contraction of the form. There is but one constant symptom in these eyes, and that is increase in intraocular tension.

Not only has too much reliance been placed upon the excavation of the disc in the diagnosis of glaucoma, but a misunderstanding as to the part it plays in producing the atrophy of the nerve fibers, with accompanying loss of vision, has contributed to the difficulty of diagnosis. It has been taught that the pressure on the fibers of the optic nerve as they cross the sharp edge of the cup, causes them to atrophy, with subsequent destruction. Clinically, this is apparently not always true, for some eyes go to blindness and many show atrophy with varying amount of visual loss without excavation; and, inversely, there may be very deep glaucomatous cupping with comparatively little decrease in central vision or contraction of the visual fields. It is much more probable that atrophy is the result of pressure on the ganglionic cells of the retina. These cells die because of interference with their blood-supply, which results from the increased intraocular tension. The optic nerve fibers then degenerate.

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(4) Texas State Jour. Med., May, 1922.

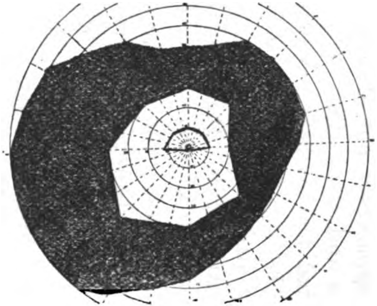


Fig. 11 (Case 2).—Showing field of atrophy and disc appearance of primary atrophy (Haden).

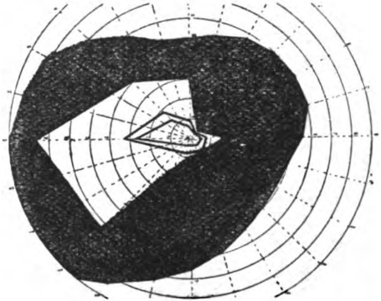


Fig. 12 (Case 3).—Optic nerve presents the appearance of atrophy. There is no abnormal cupping. Fields are typical of glaucoma.

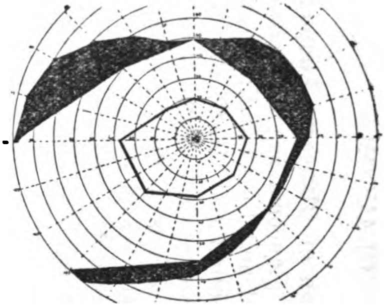
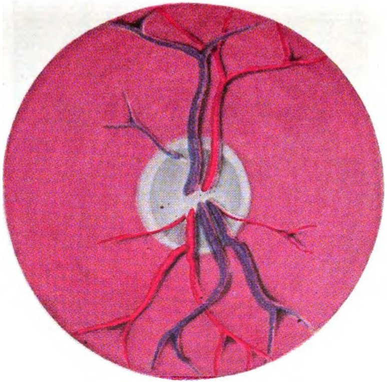
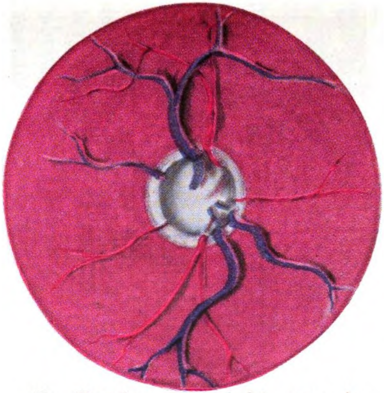


Fig. 13 (Case 4).—Field shows very little contraction. Optic nerve is deeply cupped.

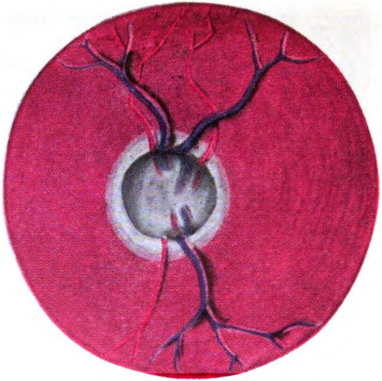
PLATE IX.



A. Appearance of fundus of right eye in Case 1, when first seen. Nerve is atropic but not abnormally cupped. Vision, counted fingers at one foot.



B. Fundus of right eye in Case 1, fifteen months later. Note typical deep glaucomatous cup. Vision was *nil*.



C. Showing deep glaucomatous cupping, with preservation of direct and indirect vision. (Case 4).—Haden, page 107.

Clinical histories of four cases are given; each is representative of a type. The first is one in which blindness occurred before the excavation of the nerve appeared; the second presented the ophthalmoscopic picture of primary atrophy with the fields of atrophy; the third, the disc was that of atrophy but the fields were those characteristic of glaucoma; and the fourth had an unusually deep glaucomatous excavation, with preservation of central and indirect vision.

These cases are shown in Plate IX and Figs. 11, 12, and 13.

Haden thinks that simple glaucoma may begin at any age and may occur in myopes as well as in hyperopes. In hyperopia the cornea is smaller than in the average normal eye; in myopic eyes it is not. The glaucomatous cupping of the disc may not appear until the vision is much impaired or blindness has ensued.

Simple, Chronic Glaucoma. Lt.-Col. Henry Smith[5] says that in the United States the general consensus of opinion is that iridectomy properly done gives better results in glaucoma than trephining apart from it not being liable to late infection. The accepted doctrine in regard to trephining is that it forms a permanent drain into the subconjunctival tissues. There is however no means of regulating the exact size of this drain which would imply a normal tension. The drain will usually act efficiently for a few weeks and then become closed by scar tissue.

Smith thinks that an iridectomy properly done constitutes a drain for a limited time which if long enough admits of the re-establishment of the physiologic equilibrium of the eye, and that trephining results in a similar drain of somewhat longer duration and that neither drain remains permanent.

Definition of Glaucoma. According to J. Santos Fernandez[6] ocular tension is neither a constant nor decisive

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(5) Practitioner, February, 1922.
(6) Rev. Cubana de Oftal., January-March, 1921.

factor in glaucoma, and tissue resistance is very diverse both from the mechanical and vital viewpoints according as the action of the noxious agent is more or less slow.

Glaucoma, Fernandez thinks, is not a disease proper, but is the expression of the intra-ocular pressure which itself may be due to multiple causes. An experienced ophthalmologist may be deceived by this pathologic entity. It may happen that a patient having an iridectomy for cessation of pain may have lost vision restored.

Treatment of Glaucoma. In order to judge of the curative value of different anti-glaucoma operative procedures Uthoff[7] compared the results in 1000 patients on whom he had carried out 1749 operations. Of these, 1405 operations were iridectomies, 181 were anterior sclerotomies, sixty-five cylodialyses, forty-nine trepanations, forty-three posterior sclerotomies, six sclero-iridectomies.

Of the total number 23 per cent. were acute inflammatory glaucoma cases. Uthoff arrives at the conclusion that iridectomy should never yield to the more recent operative methods as from the point of view of complications it is more satisfactory. Iridectomy gave 95.6 per cent. success with amelioration of the sight in 56 per cent., maintenance of the sight as it was in 38 per cent., a temporary success in 7 per cent. and failure in only 4.4 per cent. of the cases. A definite lasting success can be claimed in 88.6 per cent.

In inflammatory chronic glaucoma the corresponding figures were 80, 21, 53.3, 20, 12, 68 and 0.5 per cent.

In simple glaucoma there was 75 per cent. success.

Surgical Treatment of Glaucoma. P. Lagrange[8] reviews his fistulization method of treating glaucoma on the basis of 104 operative cases. The method, as devised by Lagrange in 1905, consists essentially of resecting a scleral strip to make communication between the anterior chamber and the subconjunctival spaces. An iri-

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(7) Klin. Monats. f. Augenhlk., September, 1921.
(8) Press méd., May 24, 1922.

dectomy may have to be done to avoid incarceration of this membrane in the wound.

The fistulization method is effected by three surgical methods; either by a simple limbus anterior sclerotomy; or by a sclerotomy with peripheric iris buttonhole; or by a sclerecto-iridectomy.

A. In fifty-nine cases of chronic glaucoma with constant hypertension: (*a*) Twenty-nine patients were operated on by sclerecto-iridectomy; (*b*) fifteen by sclerectomy with iris buttonhole; (*c*) fifteen by simple sclerectomy.

B. In forty-five cases of chronic glaucoma with intermittent hypertension: (*a*) Twenty-five patients were operated on by sclerecto-iridectomy; (*b*) four by sclerectomy with iris buttonhole; (*c*) sixteen cases by simple sclerectomy.

In fifteen of these 104 cases the result was a failure. In eight there was a diminution of visual acuity and appearance of a spontaneous cataract a long time after operation; four of these cataracts were however successfully operated upon.

In the treatment of chronic glaucoma therefore the fistulization method gave 85 per cent. success, whereas iridectomy according to the best statistics gave only an average of from 25 to 30 per cent. success.

The results of the author's surgical method based on limbus-scleral resection, has verified his ideas based on the physiology of ocular tension and the mechanism which governs its alterations.

The Wicherkiewicz Crossed Posterior Sclerotomy in Cases of Chronic Glaucoma. Myotics which give good results in acute glaucoma by contracting the pupil and diminishing the intra-ocular tension fail in simple chronic glaucoma, according to Casimir Karelus.[9] Several oculists have tried different operative methods at least to check the progress of the disease and assure the patient of the preservation of a little visual acuity. The failure

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(9) Rev. gén. d'ophthal., July, 1921.

of these operative attempts led Wicherkiewicz in 1908 to devise a new operative method, *viz.*, crossed posterior sclerotomy.

The statistics collected by Romer of the results obtained by different authors from operative methods other than that of Wiecherkiewicz in simple glaucoma showed preservation (not amelioration) of the sight in 33.7 per cent. and an aggravation of the disease in 66.3 per cent. Against such poor results Karelus states that Wicherkiewicz' method of crossed posterior sclerotomy gives in simple and chronic glaucoma an amelioration of the visual acuity and of the visual field in 88.7 per cent. of the cases, an arrest of the progress of the disease in 8.8 per cent. and only 2.5 per cent. of failures. These figures are an eloquent testimony of the superiority of crossed sclerotomy. The method is not dangerous and Karelus has never had any complications.

Early operation is indicated, therefore, not alone in cases in which a simple or chronic glaucoma is established, but even when the development of a glaucoma is suspected.

Sodium Iodate in Glaucoma. Guibert[2] reports three cases of traumatic glaucoma in which he used iodate of soda with most satisfactory results. The first was a case of traumatic hemorrhagic glaucoma, the result of a blow, in which the visual acuity was reduced to 1/20 of normal. Practically no change occurred under instillation of pilocarpine, etc., for three days. After four injections of sodium iodate, 1 c.c. each, the vision was 2/3.

The second patient was manifestly arteriosclerotic with V = 1/6, after a fall; he improved to his normal vision under soda. A similar good clinical result was obtained in a third case.

[There seems to be a wide range of opinion as to the use of subconjunctival injections of sodium solutions in this condition. Thomas (*Jour. Ophthal. and*

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(2) Clin. Ophtal, January, 1922.

Oto-Laryng., Vol. V, p. 205, 1912) reported success in nine cases of primary and two of secondary glaucoma. On the other hand, Happe (*Archiv. d' Ophtal.*, Vol. 32, p. 457, 1912), in an experimental study covering eight normal and nine glaucomatous eyes, not only failed to confirm Fischer's experience, but saw a distinct rise of tension in several instances. Where lowering of tension was obtained, moreover, it was decidedly inferior to that produced by eserine.—C. P. S.]

Glaucoma Following Cataract Extraction. This unforeseen and unwelcome sequel occurs with sufficient frequency to warn operators to be on their guard, and to follow their postoperative cases more closely, as an early diagnosis is absolutely essential if vision is to be saved. W. Ralston and E. L. Goar[3] have had their attention called to this possibility because of a number of cases occurring in their own practice. They have helped to elucidate some of the more or less obscure causes that produce this condition, which in spite of their comparative frequency are but briefly mentioned in the literature of the subject.

There are several known reasons why an increase in tension occurs following cataract operation. According to Chance, there is always a blocking of the filtration angle and it is usually due to: (1) swelling of remnants of the cortex; (2) displacement and tension of the capsule, or its inclusion in the wound; (3) plastic iritis; and (4) ingrowth of epithelium from the wound, forming a cyst of the anterior chamber.

To these causes may be added: (1) an exudate blocking Schlemm's canal; (2) a falling forward of the root of the cut iris after iridectomy in combined extraction.

Stoelting in 1911 stated that inclusion of the capsule in the wound is one of the commonest causes of glaucoma and that it is usually of the chronic inflammatory type. According to Stoelting, glaucoma follows discission after simple extraction much more frequently than in the combined extraction. He questions the importance of iris prolapse in the etiology of postoperative glaucoma, referring to Holth's and Schweigger's investigations in support of his view.

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(3) Southern Med. Jour., July, 1922.

Stieren has reported three cases of glaucoma following cataract extraction and concludes that the commonest cause of the condition is the blocking of the spaces of Fontana by semifluid vitreous. In one of his patients in whom a trephine operation was done, semifluid vitreous escaped through the opening. There is no question that an inclusion of corneal epithelium in the wound with a subsequent downgrowth of epithelium, causing a cyst of the anterior chamber, may occasionally give rise to increased tension.

It seems probable that a number of causes, singly or combined, may produce increased tension after operation. The authors particularly call attention to that type of glaucoma which comes on insidiously months or years after the cataract operation, without marked inflammatory symptoms, characterized by a slowly progressive loss of vision. The absence of inflammatory symptoms is the chief reason, perhaps, why these patients, particularly those who live at a distance, fail to report to the surgeon until too late. It is often very difficult to make a diagnosis of these cases unless they can be kept under extended observation. Stieren has pointed out that perimetry is of no value in an aphacic eye because of the prismatic effect of the lenses necessary to render the vision acute enough to perceive the test objects. This does not hold true in testing the size of the blind spot, and, provided the vision can be corrected to 20/50 or better, this is an excellent means of diagnosis. The blind spots should be taken and recorded at frequent intervals. The other important diagnostic sign is a moderate increase in tension at several observations. The ophthalmoscope is of little help in early cases. The small image in the aphacic eye renders slight change in the fundus impossible of detection. In the later cases pallor of the disc with glaucomatous excavation can usually be found. The diagnosis must be made chiefly from the gradual but progressive diminution of vision without other apparent reason; the slight but constant elevation of tension, and the progressive enlargement of the blind spots. Some of the cases show low-grade inflammatory symptoms with a slight amount of pain. It is well to direct surgical cataract patients to report at least every six months for examination, and to return immediately if the vision becomes poor or other complications occur. In this way the patient will usually be seen before much damage has been done.

How shall we treat these cases? A broad iridectomy certainly is indicated. If one accepts the theory that the increased tension is caused by the blocking of Fontana's spaces by vitreous, then an operation leaving a fistulous opening seems indicated.

TOXIC AMBLYOPIA

The Ocular Menace of Wood-Alcohol Poisoning. The adoption of the national prohibition amendment in the United States, and the possible advent of similar restrictions in Great Britain make the ocular complications of wood alcohol poisoning a live topic for discussion. The more we restrict the use of ethyl alcohol, the greater is the temptation to substitute methyl alcohol, and so long as methyl alcohol remains the most deadly poison of daily commerce, so long will human eyesight, if not life itself, be menaced by ignorant, careless or criminal handling of this toxic product. As ophthalmologists, says S. L. Ziegler,[4] we have a double duty to perform: (1) to make an intensive study of the toxic effects of methyl alcohol on the delicate ocular tissues, and (2) to establish a propaganda in "preventive medicine" that will protect possible victims, whether guilty or innocent.

Three fateful factors have increased the dangers of

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(4) Jour. Amer. Med. Ass'n., Oct. 8, 1921.

wood alcohol: (1) its refinement from a nauseous, vile-smelling compound to one as clear and palatable as ethyl alcohol, (2) its fatal cheapness, which has naturally resulted from the increased output and the improved methods of manufacture, and (3) its unusual solvent power which has so greatly encouraged its use in the arts.

In America we have (1) ethyl alcohol, which is either absolute (99 per cent.) or rectified (90 per cent.); (2) methyl alcohol, which may be either the commercially impure liquid or the purified product, and (3) denatured alcohol, which was formerly composed of 10 parts of methyl alcohol and one-half part of pyridin bases, added to 100 parts of ethyl alcohol; but since December, 1919, this formula has been modified by a reduction of the methyl alcohol from 10 to 2 per cent. There is a well-founded suspicion that in order to evade the prohibition act unscrupulous chemists are submitting this denatured alcohol to fractional distillation so as to remove the benzin and wood alcohol and thus secure an impure ethyl alcohol which can be sold for drinking purposes.

In the United Kingdom, this product is better regulated, and, therefore, the cases of blindness have been fewer, although it is quite possible that many cases have escaped detection and reporting.

Ziegler, who has made an exhaustive survey of the situation, arrives at the following conclusions:

Wood alcohol is the most deadly poison used in daily commerce.

One teaspoonful has been known to cause blindness and one ounce to cause death.

The port of entry may be the mouth, nose or skin.

Wood alcohol should be identified by Robinson's test.

It is a protoplasmic poison possessing a selective affinity for the delicate nerve tissues of the eye.

Its biochemistry is modified by oxidation, first to formaldehyd and then to formic acid, both of which are corrosive poisons.

Formic acid is the end-product excreted by the kidneys.

If formic acid is present in the urine, it will promptly reduce Fehling's solution, thus suggesting to the inexperienced a false diagnosis of diabetes.

Van Slyke's test will reveal acidosis in the early stages and alkalosis later.

Sudden blindness with vomiting and abdominal pain should always arouse suspicion of methyl alcohol poisoning; especially if diplopia or ptosis is associated.

Papillitis, sector-like atrophy and sudden sclerosis of the nerve-head are equally typical fundus lesions.

Symptoms of pituitary injury are most suggestive in pointing to this as the primary and fundamental lesion.

Contracted fields and central or paracentral scotomas are usually present.

Treatment should include early neutralization by alkalies, and elimination by lavage, emetics, diaphoretics and rapid oxidation, together with stimulation of the optic nerve by negative galvanism applied directly to the eye. Thyroid extract and pituitary extract may be indicated.

The manufacture and sale of wood alcohol should be prohibited or regulated by law.

If sales are permitted, safeguards and warnings should be required and the public instructed as to the great danger to vision and life.

A special revenue tax with registered "poison sales" would regulate and record its distribution and in cases of poisoning reveal the source.

This tax should equalize the cost of denatured alcohol and methyl alcohol and thus remove the temptation to adulteration because of cheapness.

All wines, whiskies, toilet articles and "patent medicines" imported from foreign countries should be tested for wood alcohol before passing through the customs inspection.

The name "methanol" specifically designates this product and yet avoids the tempting suggestiveness of the word "alcohol."

Visual Complications From the Abuse of Alcohol and Tobacco. The eye disturbances arising from the abuse of alcohol and tobacco ought, according to A. Tersou,[5] to attract attention because they can be easily detected without or before endoscopy and because they can be completely cured by medical treatment if instituted in time.

Clinically such patients have poor sight. The disease is a central scotoma of the visual field. There is a distinct trouble in the recognition of colors, certain colors, on small surfaces. While a large surface of color is recognized a small area of the same color is not. The scotoma is due to an elective intoxication of the macular region and of the optico-cerebro-retinal macular bundle, but there may be, co-existent with this, a subcortical or cortical intoxication in connection with the faisceaux. Ophthalmologic examination shows almost complete integrity of the fundus, so that the syndrome is that of an amblyopia.

Alcoholic intoxication may cause atrophy of the optic nerve. Outside of this in alcoholic and tobacco intoxications the prognosis is usually good.

Terson has never seen a toxic neuritis in an alcoholic who did not smoke, but he has seen pure tobacco ambyopia in excessive smokers who did not use alcoholic beverages.

The visual disturbances appear rather suddenly, being immediately occasioned by some psychic or nutritional cause.

The best treatment is abstention from alcohol and tobacco with general treatment to improve digestion and functioning of the emunctories. Absolute abstention need not be insisted on, but the habits must be restricted by degrees. Glasses to correct the visual errors

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(5) Presse méd., May 21, 1921.

should be prescribed. Tobacco amblyopia generally yields completely to energetic treatment.

Effects of Nicotine on Vision. T. B. Bradford[6] makes an appeal to big corporations to put the ban on nicotine as the drug above all others which is liable to cause blindness at a time in the life of an individual when it might cause serious results. This refers especially to railroad engineers and others who depend on the acuity of their vision.

Bradford quotes from various publications to show the noxious effects of nicotine (tobacco smoking) on the eyes.

OCULAR TUBERCULOSIS.

Tuberculosis and the Senile Arc. Lortat-Jacob and Turpin[7] find that in the tuberculous the occurrence of a corneal circle, the so-called senile arc, is not necessarily a sign of old age, but of a general tendency to sclerosis. In thirty tuberculous patients with the senile arc, who ranged in age from 34 to 45 years, the tuberculosis in all was of the fibrous type, a relatively favorable form. The occurrence of the so-called senile arc is generally, therefore, a good prognostic sign. The arc is more frequently seen in men than in women.

Effect of Tuberculin on the Eye. J. Gonzales and M. Vélez[8] have made some experimental investigations on the effects of tuberculin on the healthy and diseased eye, the old tuberculin having been used for diagnosis and new tuberculins for treatment. These experiments include 906 eyes either apparently healthy or tuberculous, and eyes apparently healthy of persons who were evidently tuberculous.

Koch's old tuberculin injected subcutaneously was used in four groups as follows: In twenty-two healthy

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(6) Surg. Jour., May, 1922.
(7) Bull. soc. méd. d. hôp. de Paris, July 8, 1921.
(8) Clin. Ophtal., September, 1921.

persons with healthy eyes; in twenty-four persons with diseased eyes but clinically free from tuberculosis; in ten tuberculous patients with healthy eyes; in seven cases of suspected tuberculosis. In the first group there were no eye phenomena; in the second group there were six positive reactions, three general and local; the third group gave eight positive and two negative reactions but no phenomena referring to the eye; in the last group all gave a positive general and local reaction.

With regard to tuberculin treatment, this is commenced by 1/000 or 1/500 of a milligram, according to the reaction and this is only increased if no reaction is produced. Increase in dose ought to be gradual and progressive up to the injection of 1 milligram of the dry substance which should never be increased.

Gonzalez' results in five patients submitted to tuberculin therapy are encouraging, after four or five months of continuous treatments.

The Ocular Manifestations in Encephalitis Lethargica. This most interesting disease has been named encephalitis ophthalmoplegia; encephalitis lethargica; epidemic encephalitis and sleeping sickness.

We have positive evidence of an acute encephalitis in these cases, but at present we can not classify this disease as epidemic, as it has not reached this stage numerically.

This disease made its first appearance in Vienna in the winter of 1916 and was called encephalitis lethargica by v. Economo in April, 1917. France and England were invaded in the spring of 1918 and it has been prevalent throughout the world since that year. There were 136 cases on March 4, 1921, in England, with twenty-two cases in London.

Reports indicate that the disease is widespread in the United States. The first cases appeared in the autumn of 1918 on the eastern coast and in October, 1919, the western coast was invaded.

We must not confuse this disease with the sleeping sickness of Africa..

Lethargy, somnolence or even coma is present to a greater or less extent in all these cases.

G. I. Hogue[1] calls attention to the fact that the ocular manifestations appear early in nearly all instances and it is frequently the earliest symptom complained of by the patient.

The ophthalmologist is frequently the first to be consulted and he must not overlook the causal factor when the patient complains of double vision or drooping of the eyelids. There are, in all probability, a large number of these cases with us but the symptoms are so mild and transient that they are not attributed to encephalitis. Every case should be reported in order to obtain accurate statistics.

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(1) Wisconsin Med. Jour., November, 1921.

The eye symptoms in order of frequency are as follows: Diplopia, ptosis, impaired accommodation, nystagmus, sluggish pupils, optic neuritis, papilledema.

It is the tendency for the ocular symptoms to result in recovery and therefore the prognosis of eye disturbances is good if the patient survives.

The diplopia, due to motor paresis or paralysis, is of central origin and is usually transient. The nerve involvement in order of frequency is the sixth, third and rarely the fourth. The latter is easily overlooked because it is not seen when ptosis appears or when the patient is in a stage of lethargy.

The diplopia is noted in the distance and in every direction, but it does not usually cause disturbance while reading. The vision is generally normal in the distance as well as for the near. The motility is also preserved in most cases. This symptom is usually the first to disappear, but may recur and affect the opposite eye. The pathology is unknown.

The ptosis is bilateral usually and may be complete but is frequently partial. In the state of lethargy the lids may be closed and opened with great difficulty. A tremor of the lids is frequently observed in this disease. The ptosis is due to weakness of the levators. Ptosis combined with ocular paresis is rarely met with in any other disease and is pathognomonic of encephalitis lethargica.

Impaired accommodation is manifested by quick fatigue and the emmetrope can not read even at arms' length. This symptom is the last to leave, persisting sometimes for many months. The pupils are frequently sluggish in action and there may be irregularity and inequality, bilateral usually. The pupils in some cases remain dilated and fail to react to light.

The nystagmus may be light or pronounced. Sometimes merely nystagmoid twitching is seen. The facial nerve is sometimes involved and this usually unilaterally. There is rarely lagophthalmus.

Optic neuritis is manifested by a blurring of the optic disc and is probably due to dilatation of the capillaries with the resultant congestion of the retinal veins.

Papilledema is a rare condition.

The inflammatory changes in the brain are extensive. The macroscopic inspection reveals meningeal congestion and petechial hemorrhages in both the white and gray matter, edema is also usually present. The base of the brain is the seat of predilection. The result is pressure on the nuclei of ocular nerves.

Microscopically we find perivascular cellular infiltration and minute hemorrhagic areas rather discrete in the subthalmic area.

The cerebrospinal fluid is usually normal and the pressure normal. The course varies from a few days to years. Mortality is about 25 per cent.; death is due to involvement of the respiratory center.

The organism has been isolated by Drs. Loewe and Strauss of New York and confirmed by Dr. Thalheimer of Milwaukee.

There is no relationship to influenza or botulism, as was once thought.

The disease is apparently not contagious. Health Commissioner Copeland of New York agrees with this statement.

Therapy is symptomatic. The rest cure should be insisted upon in every case—rest for the eyes as well as for the body. Young adults are the most frequent victims of this disease.

Differential diagnosis must be made from brain tumor, extradural abscess, meningitis (T. B., or serous), uremic or diabetic coma, cerebrospinal lues, hysteria.

Epidemic Encephalitis and the Eye. Among the sequels of epidemic encephalitis Cerisé[2] mentions bilateral complete atrophy of the optic nerve, scotoma and blanching of the papillae. Motor disturbances may range from insufficiency of convergence to intense Parkinsonian

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(2) Medécine, January, 1922.

symptoms and are very lasting. The conditions may easily be mistaken for defective accommodation.

The Ocular Factor in Headache. The symptom for which an ophthalmologist is most frequently consulted is headache. The ocular factor in all forms of headache is greater than is generally supposed, probably not less than 40 per cent., while of all bilateral frontal headaches, 75 per cent. are due to eyestrain. Headaches due to eyestrain are invariably bilateral; the hemicranias are not commonly due to eyestrain.

In the study of headache, the site, the character of the pain or distress, the itme of day of its occurrence and greatest severity, the character and amount of employment of the eyes, and the state of the general health are the important determinations for the ophthalmologist.

The site of the headache, when eyestrain is responsible, as pointed out by J. A. Kearney,[3] is often misleading as to the character of the existing error of refraction. In a general way, a frontal or supra-orbital headache indicates a hyperopic error; occipital, and imbalance of the extrinsic ocular muscles, and temporal, an astigmatic error. When headaches occur in more than one locality, a combination of refraction error is suggested—for example: headache occurring in frontal and temporal regions at the same time foreshadows a hyperopic error combined with an astigmatic one—compound hyperopic astigmatism. Variations from these rules are not infrequent, however.

The character of headaches due to eyestrain is usually dull, sometimes boring on excessive use of the eyes, seldom knifelike. Toward the end of the day headache due to eyestrain is severest in patients who use the eyes continually, especially for close work; and in this particular it differs from headaches that most nearly simulate them, which are due to diseased conditions of the nose and its accessory sinuses. These, as a rule, are worse on arising and lessen as the day advances, and probably can be ac-

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(3) New York Med. Jour., Nov. 16, 1921.

counted for by gravitation and collection of secretion in the lying posture during the night, with a gradual distribution and elimination of these accumulations during the day.

At a time when a patient is much reduced in health, or is convalescent from a long-standing or febrile disease or a major surgical operation, asthenopic (eyestrain) symptoms or other remote distresses, the result of errors of refraction, are apt to become manifest. In good general health the effort necessary to overcome an existing error of refraction or extrinsic muscular imbalance may give no reflex headaches or other distresses, but when the eye musculature, consisting of the ciliary muscles of accommodation and extrinsic muscles, is weakened through constitutional disturbances that tend to lower vitality—the same use of the eyes which, when in health, produce no untoward symptoms, at this time is attended by the reflex headaches that are characteristic of eyestrain. Examination at this time under a mydriatic is advisable, and when there is found an error of refraction or extrinsic muscular imbalance, relief is usually expeienced when they are corrected. However, if the patient has been wearing glasses, the original symptoms may recur, which his lenses were prescribed to correct. An examination under a mydriatic and glasses containing the present correction, will nearly always clear up the complaints when they are found to be due to errors of refraction.

Because a patient is wearing glasses is no evidence that the correction is what it should be at the time he seeks relief. By questioning, one will frequently find that the glasses he is now wearing were ordered without the use of a mydriatic and sometimes he is wearing a correction which, although it has been estimated under the effect of a mydriatic, has now been changed by time or by a lowered state of health.

Abnormalities in the shape of the globe, particularly the short eye of the hyperope and the irregular curvature of the cornea in the astigmatic or combination of the two defects are usually hereditary, and are responsible for the majority of headaches due to eyestrain. By wearing glasses containing the accurate optical correction relief is usually experienced.

If, however, an imbalance of the extrinsic muscles is associated, the problem requires more careful consideration. The methods employed for relief depend upon the personal equation of the ophthalmologists, which experience best brings. It is often a fastidious point to decide just what measures suit each case, as many factors are to be considered. Imbalance of vertical extrinsic muscles give more pronounced headaches than imbalance of the other muscles that are concerned in the movement of the eye. A lateral imbalance up to six prism diopters may not give symptoms, but an error as low as one prism diopter of vertical imbalance is often responsible for many complaints, and requires careful added attention. Such discrepancies are much more likely to produce other reactions: vertigo, nausea, and symptoms the result of remote reflexes.

The patient's description of his headache should be noted, and too much care can not be taken in getting details of the complaints. Given a patient suffering from headache, with a suspicion of an existing error of refraction, an estimation of the correction under a mydriatic is always indicated up to fifty years of age.

Quite frequently a patient suffers from headache that has every semblance of that due to eyestrain with no external evidence of inflammation, and upon examination and tests has no refraction error present. In a number of these cases, by turning the lids and carefully scrutinizing the conjunctiva, it may disclose changes from loss of luster to decided disease. In cases of this type, the complaint most generally heard in addition to headaches, is drowsiness that occurs in the afternoon. As a matter of fact, many who have applied for relief of headache had thought they required glasses, but examination determined the cause to be conjunctival disease. The symptoms disappear as a rule as soon as the conjunctiva has responded to a course of treatment. Headaches due to glaucoma, iritis, keratitis, conjunctivitis and other diseases that attack the eye structures and adnexa are readily recognized as presumably caused by the affection when found.

Hemicrania is usually a symptom when intra-ocular tension (glaucoma) is present, and an ophthalmoscopic examination of the fundus of the eye in all migraine subjects should never be neglected, because it reveals occasionally a cupping of the optic disc, the result of tension, even when there is no external evidence of this disease.

A careful ophthalmoscopic examination of the fundi of the eyes is imperative in every patient who complains of headaches that are persistent and uncontrollable. By such examination many of the brain tumor cases admitted to our hospitals disclosing choked discs are diagnosed as such for the first time. An ophthalmoscopic survey of the fundi of the eyes often discloses changes in the structures that suggest anemias, arteriosclerosis, toxemias and other dyscrasias which might be held accountable for headache.

Not one of the routine determinations of the many that go to make up a complete eye examination should be omitted when a headache patient consults for relief, and if our best efforts are not sufficient to allay the distress entirely, advice should always be given the sufferers to seek for possible source elsewhere.

[The term "mydriatic" is frequently used as synonymous with "cycloplegic." It has been so employed in this article; and erroneously so. In estimating the refraction of an eye, the object is temporarily to paralyze the ciliary muscle. A mydriatic (pupil dilator) will not always do this. Cycloplegics also act as mydriatics, but a mydriatic is not necessarily a cycloplegic. —C. A. W.]

Blindness Following Influenza. Infectious optic neuritis is caused very frequently by influenza. The neuritis may manifest itself as a papillitis or as a retrobulbar neuritis. In view of the large number of cases of influenza occurring at the present time, it is reassuring to know that the prognosis of the blindness which results is favorable.

The characteristics of this condition are well exemplified in the case reported by S. E. Denyer.[4]

The patient, a young woman aged 17, was, during convalescence from influenza, attacked with papillitis, which was accompanied by blindness of rapid onset and frontal and temporal pain. The sight was gradually recovered in the course of three or four weeks. There was no evidence of cerebral tumor or abscess, or of syphilis, and the Wassermann reaction of the cerebrospinal fluid was negative.

Uhthoff thinks that the optic nerve conditions are most apt to arise during the stage of convalescence and are probably due to the action of toxins and not directly due to microörganisms.

Again, Jeliffe and White, in *Diseases of the Nervous System* (third edition), say: "Acute axial neuritis occurs usually in young adults, 12 to 24 years of age, more particularly women; frontal or temporal headache, or deep pain in orbit, made worse by pressure or by movements of the eyeballs; loss of sight is rapid, reaching a maximum in five days, and often is so severe that the patient can just count fingers at fifteen feet or is blind."

After the acute stage is over there is gradual recovery of sight.

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(4) Brit. Med. Jour., Feb. 11, 1922.

Obscure Forms of Posterior Uveitis and Their Relation to Sinus Disease. It is unnecessary to emphasize the very intimate relation which exists between a pathologic eye and sinus disease. The avenues by which the visual pathway may become involved are well known. The paths through which toxemias may be carried are also matters of general knowledge. The difficulty lies in establishing a cause and effect relation between sinus disease and the toxemia as manifested in uveitis. It is difficult at best to determine the etiologic factor in many forms of posterior uveitis. In certain types of obscure recurring attacks of inflammation of the uveal tract, the ophthalmologist is frequently nonplused and at times he feels almost hopelessly baffled in arriving at a correct conclusion as to the cause. A case reported by L. C. Peter[5] is illuminating in this connection.

The patient, a young man 35 years of age, had recurring attacks of uveitis alternating between his two eyes. In careful studies the Wassermann was found negative, teeth and tonsils were eliminated and a physical examination, which on first report yielded negative results, finally uncovered an old tuberculous process at the apex of the right lung. Roentgen-ray examination confirmed the lung findings and also revealed a clouding of the right sphenoid and posterior ethmoid areas. Rhinologic studies by two capable specialists failed to discover any evidence of sinus involvement although a turbinectomy was performed in each naris. The several attacks responded slowly but not completely to tuberculin treatment. An overdose of tuberculin, administered by an assistant by mistake, was followed promptly by a marked constitutional and a rather disturbing focal reaction in the eyes. This confirmed the original diagnosis, but why was recovery not complete under tuberculin treatment? The diagnosis was strengthened by the chest findings

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(5) Penn. Med. Jour., December, 1921.

and repeated *x*-ray examination of the sinuses seemed to furnish evidence that the toxemia might be lodged in the sinuses. Finally the invasion of the left macula with a semilunar cutting of the upper outer part of the left field gradually extending towards the center of the field until central vision had entirely disappeared, gave unmistakable evidence of a localized field of pathology in the neighborhood of the left optic nerve. Notwithstanding the two negative reports from two rhinologists, the patient was referred to a third for study. This examination revealed well-advanced disease of both sphenoid and posterior ethmoid groups with apparent occlusion of the ostia. Operation confirmed the diagnosis. Right and left groups were found to be the seat of advanced and chronic disease. After three years of study and treatment the cause was found; but at what a price to the patient from both a financial standpoint and that of damaged vision!

The first practical lesson which may be drawn from this, and many other cases not unlike it in character, is the fact that sinus diseases should be seriously considered as an etiologic factor in all cases of obscure uveitis. More than ordinary routine methods of examination should be employed. The case should be studied most thoroughly from this standpoint by one who has the knowledge and courage to explore when circumstantial evidence is sufficiently strong to warrant exhaustive study. It is not unlikely that the sinuses are responsible for the harboring not only of tuberculous toxins but of others as well, without marked or gross evidence of sinus pathology. It is a logical conclusion, therefore, in obscure cases of uveal disease or in cases in which the cause may be evident but the response to treatment unsatisfactory, that exploration and drainage of the sinuses should at least be given due consideration.

There is urgent necessity of team work in the management of sinus diseases. The greatest efficiency of surgery in abdominal and chest conditions is only made possible by coöperation with the internist. The neurologist is a *sine qua non* in brain surgery. To no less a degree is the ophthalmologist an aid to the rhinologist in disease of the sinuses. Even though sinus disease is patent to the rhinologist, operative interference is no more justified without an ophthalmological study than is the brain surgeon justified in operating upon a brain tumor without the counsel of neurologist. On the other hand many obscure conditions can be fathomed only by the combined and exhaustive study of both. Sinus disease is in "no man's land" and it can be explored and reclaimed only by the hearty coöperation of rhinologist and ophthalmologist.

Optic Neuritis Following Nasal Accessory Sinus Disease. L. Redding[6] calls attention to the frequently overlooked diseased nasal sinuses, as causative factors in optic neuritis and makes a plea for more thorough exploration of the sinuses in patients suffering from optic neuritis.

The term neuritis as here used, is meant to include every condition in the optic nerve, from retrobulbar neuritis, in which no change is seen, up to and including optic atrophy.

While there are many causes of optic neuritis, the changes that occur in the nerve, if we except direct toxic action, are nearly always due to pressure, frequently from an exudate and less frequently from newly formed tissue.

The first symptom complained of by the patient is dimness of vision in one eye, usually with a rapid onset and frequently without pain. With the ophthalmoscope, any change from a slight blurring of the disc, papillitis, edema, or choked disc to optic atrophy may be found, the condition seen depending on the duration and extent of the pathologic processes. The retrobulbar neuritis shows no change in the nerve, the diagnosis being made from the other symptoms present. The perimetric find-

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(6) Penn. Med. Jour., February, 1922.

ings are valuable if the patient is seen early enough in the course of the disease. The first finding is usually an enlargement of the blind spot of Mariotte; later, with further involvement of the nerve, there is more and more contraction of the form and color fields; and, finally, when central vision is lost, the perimeter is of little value. The campimeter of Peters is the most satisfactory instrument for the examination of these cases. The *x*-ray should be used routinely in every case.

After every possible or probable cause of the neuritis has been ruled out, the patient should be sent to the rhinologist. Most rhinologists hesitate to explore the sinuses in the absence of definite lesions; however, the ophthalmologist should insist upon it.

The main object of treatment is to relieve the pressure on the nerve. The prognosis of optic neuritis due to sinus conditions is good if seen before the stage of atrophy sets in, and in some of these cases the disease is arrested, while in a few even a slight improvement is noted.

In eight cases which Redding reports, the usual causes of optic neuritis, such as a brain tumor, gumma, methyl alcohol, etc., were not present. The sphenoid and ethmoid cells were the primary seats of trouble, and when one considers the anatomic relation of these sinuses to the optic nerve, it is not difficult to see how the neuritis was produced.

Seven of the eight patients were *x*-rayed and it is interesting to note that all were reported negative, although pus was found in seven of them. The *x*-ray should be used routinely in every case, but a negative finding does not prove the absence of diseased sinuses. The ophthalmologist should learn to read his own plates and frequently much valuable information may be obtained from so-called negative ones.

Given a case of optic neuritis: After ruling out every other cause, and with the nasal condition apparently normal, the diagnostic limit has not been reached until exploratory puncture of the posterior ethmoid and sphenoid sinuses has been made.

Types of Sinus Disease Affecting the Eye. As pointed out by C. De Weese,[7] there are five types of accessory sinus disease affecting the ocular apparatus: acute or chronic sinuititis, with external manifestations, as orbital cellulitis, abscess, tumor or edema of the eyelids; sinuititis, without external signs, but accompanied by optic neuritis, retinal disease, scotoma, visual field defects or ocular muscle paralysis; sinuitis, as possible cause of glaucoma, iritis, keratitis, uveitis, etc.

Asthenopic symptoms due to sinus disease are usually reflex in nature but may be also due to a toxic process or to stasis in the orbital circulation resulting from circulatory disturbances within the diseased sinuses. It has been found that from 7 to 10 per cent. of the patients who consult the oculist on account of headaches are really suffering from disease of these sinuses.

The location of pain and headache due to sinus disease is not constant for each sinus, although in a general way the walls of the affected sinus are usually painful to pressure and stooping frequently serves to localize pain by causing a sensation of pressure with increase of the pain within the affected cells.

Sinus pain is frequently paroxysmal, beginning and ending at about the same hour each day, and a confusing fact is the inability to use the eyes comfortably during the attacks of pain, leading the patient and his oculist to believe that the origin must be ocular.

In each of these cases, however, there are always intervals during which the patient experiences no discomfort, no matter how much he uses his eyes, and again the pain of a sinus disease may occur at night, unlike the pain of eyestrain, which is practically always relieved by rest.

The eyelids may show edema, as a result of frontal or anterior ethmoidal infection and this tends to lessen as

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(7) Kentucky Med. Jour., February, 1922.

drainage is established, being less at night than in the morning. Where orbital involvement occurs the lids become swollen, red and indurated, with edema of the conjunctiva.

The cornea and sclera are rarely affected in sinus disease, although de Schweinitz has observed a wrinkling of the corneal epithelium in a few cases of episcleritis, due to sinus disease.

Examination of the eyeground and of the optic nerve is ofttimes of little value diagnostically, unless used in conjunction with other refined methods of diagnosis.

OCULAR INJURIES AND FOREIGN BODIES IN THE EYE

Penetrating Wounds of the Eyeball. Penetrating wounds of the eyeball constitute one of the most important lines of cases presented to the oculist for his consideration, by reason of the attendant symptoms and dangers that present themselves.

Penetrating wounds of the eyeball may involve the cornea, the sclera, or both, with the underlying tissues, and by reason of their delicate construction, the wounding of these structures is often attended with the direct consequences, if not to life, then to the eyesight of the unfortunate victim of the accident that has produced the train of consequences that follow in its wake.

Wounds made by foreign substances may or may not be sterile *per se;* yet later they may be infected from the surrounding structures, leading to all the results of inflammation.

Wounds made by surgical instruments, properly sterilized may also have unfortunate sequels by reason of inability to sterilize properly the site of the operation.

The case may be unfortunately situated so that prompt aid can not be given, and if given, there may be some fault in the technique, that may result disastrously.

It is this threatened loss of eyesight that should move us to look to this subject with the utmost care, lest blindness to our patients shall ensue as a result of our unpreparedness.

C. W. Reynolds[1] goes somewhat into detail in calling attention to this common form of eye injury.

Penetrating wounds of the eye he divides into firstly those of the cornea; secondly those involving the sclera and cornea, and lastly those involving the sclera. Of course with the latter two groups will be considered those involving the underlying structures.

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(1) Kentucky Med. Jour., December, 1921.

Penetrating wounds he divides into the incised, punctured, and lacerated wounds.

Incised wounds are made by a sharp cutting body, as a knife, thin sharp cutting pieces of metal, slivers of glass, which cut smoothly, the wounds having a tendency to close.

Punctured wounds are those that push their way through the coats of the eye, leaving a more or less round opening permitting the escape of the contents of the eye, until plugged up.

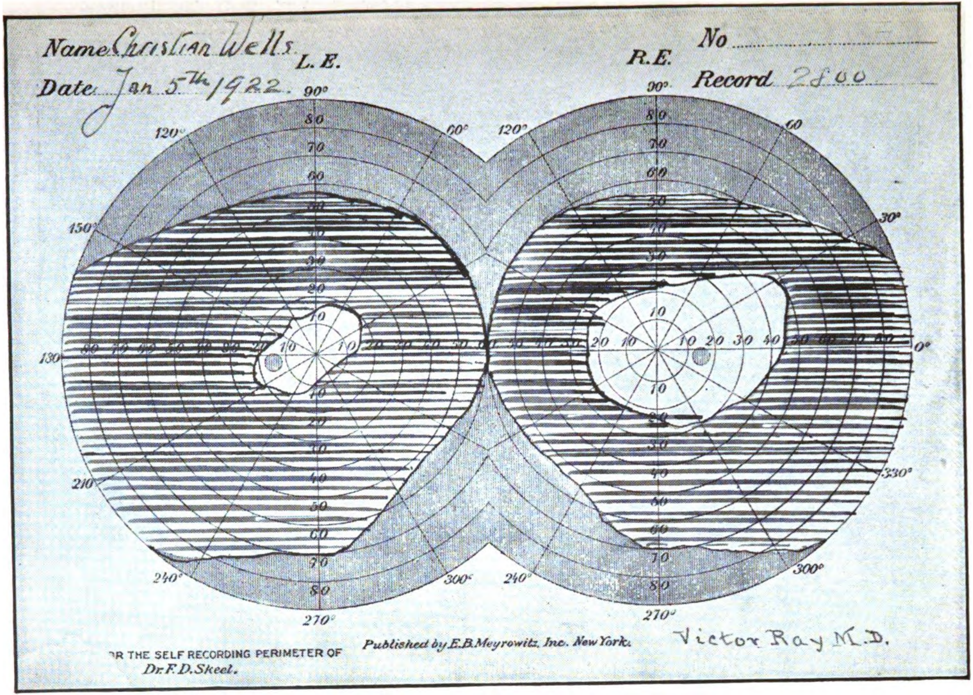
Rupture of the eyeball, usually the scleral coat, leaves a lacerated wound.

Penetrating wounds of the eyeball are followed by almost immediate reduction in eyeball tension, the degree depending on the amount of either aqueous or vitroeus humor lost.

Small wounds of the cornea, of the incised type, may close almost immediately after the wound has been made; still the anterior chamber will be found to have less depth than has its fellow—the uninjured eye. A little pressure on the cornea will result in a still further flow of aqueous humor. If the wound is quite extensive, or the loss of the aqueous humor has been sufficient to allow the iris to come close to the wound, the iris may be found to have become incarcerated, and considerable fluid may have escaped externally.

When the coat of the eye has been perforated, the question arises, is there a foreign body within the eye? This question must be decided and decided at once, if possible, as upon the decision may hinge the success of the ensuing treatment. When the inflicting instrument is considered, a sharp knife, or bit of metal that can be
In some cases the foreign body may pass through the
seen, or when the object that inflicted the injury is found to be intact, the question is quite easily answered. When the inflicting cause has not been found by ocular examination, some data may be found by means of an *x*-ray examination. An *x*-ray also has its limitations.

PLATE X.



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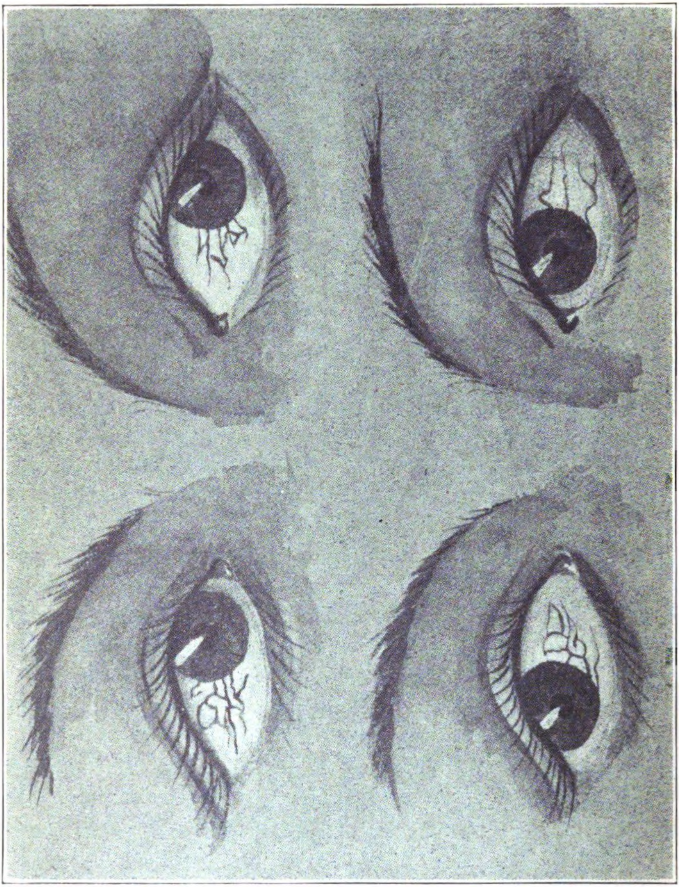
Victor Ray M.D.

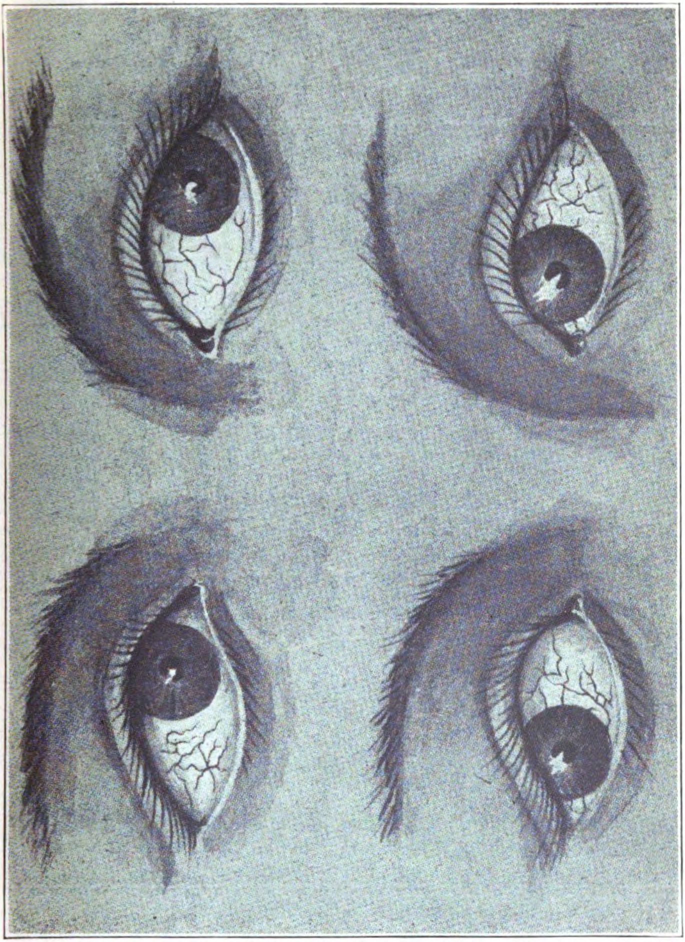
Restricted fields from gunshot wound of the cranium.—Ray, page 140.

PLATE XI.



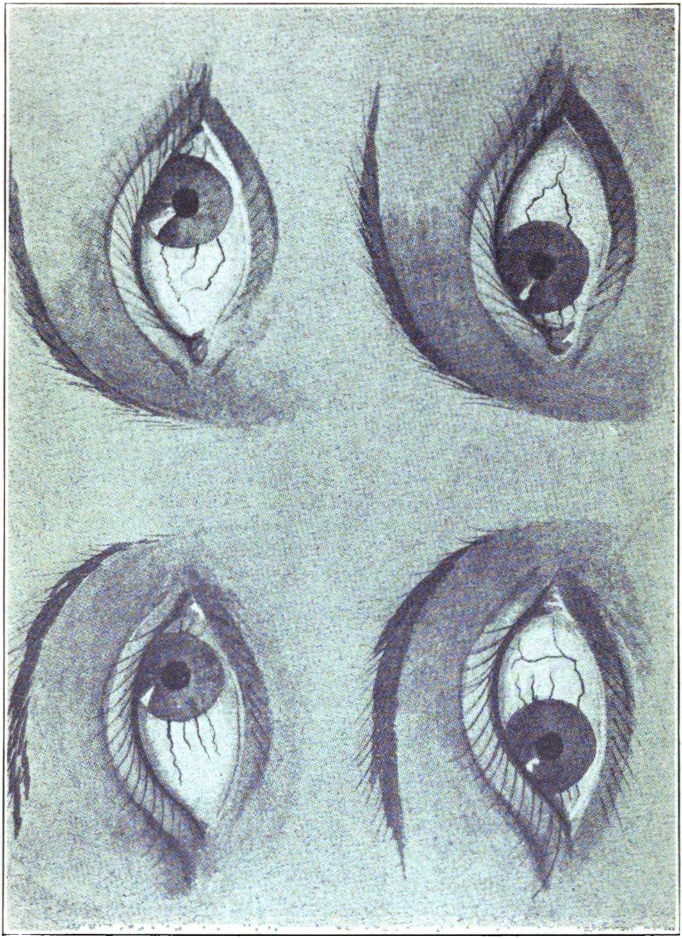
Typical effects in eyes exposed to yperite.—Dor and Fouassier, page 142.

PLATE XII.



Typical effects in eyes exposed to yperite.—Dor and Fouassier, page 142.

PLATE XIII.



Typical effects in eyes exposed to yperite.—Dor and Fouassier, page 142.

cornea, iris, suspensory body and be found in the vitreous, where it will set up trouble in most cases unless removed forthwith. The injury becomes more serious the further back it involves the structures of the eyeball. The aqueous humor may be almost all lost, and yet when the wound is closed, the humor will re-accumulate and vision be restored to normal. This is not the case when the vitreous humor is in great part lost, for with its loss, there is more or less disorganization of the delicate structures of the eye, with consequent impairment or loss of vision.

Not only may the vitreous be lost, in part or in whole, but the uveal tract may prolapse into the wound to such a degree as to prevent the proper closure of the scleral wound, giving rise to a condition which may cause subsequent trouble, not only with the injured eye, but also in the uninjured one by sympathetic disturbance.

In some cases it will be found that the lens is either dislocated or else even forced out through the wound, producing a distorted vision, even if the eyeball does not break down in inflammatory changes. Accompanying this loss of the vitreous humor there may be more or less stripping of the retina from its attachment, this detachment being produced either by the penetrating body, or else the presence of hemorrhage, or by subsequent inflammatory changes. When it is considered how delicate is the structure of the retina, and how finely it must be focused so that rays of a light coming from a distance must be centered on it, it is not surprising how a slight disturbance of its normal position will result in impaired vision.

Very few eyes can stand the presence of a foreign body in the eye, be this foreign body ever so small. In most cases, this foreign body gives rise to various degrees of irritability, sometimes leading to complete destruction of the eyeball by panophthalmitis.

Still, in view of these unfortunate cases, there are instances on record in which a foreign body has been carried in the eye for years with no untoward results. Yet one is not warranted in stating that such a fortunate result will ensue in any particular case, as the chances are just the reverse.

The foreign body may be aseptic, yet by reason of the action of the foreign body on the tissues surrounding it, there may be produced irritative compounds which will result in the production of an inflammation that will cause a destruction of the eyeball. Bits of copper and mercury, introduced experimentally into the anterior chamber, have caused inflammatory changes to take place. Again, the foreign body may have been removed, the wound apparently healed, yet the eye be subsequently lost through a chronic inflammation resulting from a tightening of the scar tissue, or the presence of incarcerated bits of the uveal tract.

Then again the location of the injury must be taken in consideration if a probable result is desired when the patient's friends inquire as to whether the eye will ever see again. A guarded reply should always be given. Wounds of the cornea as a rule are more prone to favor able results than are injuries to the iris and ciliary body and sclera, as violent inflammation results whenever the wound of the interior of the eye has been infected. The interior of the eye is an ideal place for the growth of different kinds of germs, the inflammatory process affecting mainly the uveal tract. In the acute cases, the process is purulent, affecting the whole eye, panophthalmitis, while in the less acute the exudate is more plastic, which exudate becomes organized into a false membrane, which further organizes and contracts, gradually causing a contraction of the eyeball, an atrophy, which destroys the eyesight. This outcome of the case is more dangerous than the acute purulent form which seldom causes a sympathetic inflammation of the other eye, as is the case in the plastic forms of the trouble.

As already stated, the ultimate outcome of the case is one to be viewed with concern. The prognosis should be very guardedly stated.

The treatment should be very carefully carried out. Even then an unfortunate termination can not always be avoided.

Naturally, if a foreign body is in the eye, a reasonable attempt should be made to extract the same, if the case is seen at once. If any time has been allowed to elapse, and the wound is already inflamed, then the foreign body may have to be extracted through a new incision. Rest in bed, with sedatives, should be used to combat as far as possible inflammatory phenomena. Should the eye show a tendency to become generally involved, its early enucleation should be undertaken.

The first essential in treating these cases of penetrating wounds of the eyeball, should be the practice of thorough asepsis. The wounds of the cornea should be examined for bits of adherent iris, which should be either trimmed off or, if possible, replaced in the anterior chamber, lest a fistulous opening be established in the cornea. Wounds of the sclera should be also thoroughly cleansed, care being taken to see that there be no prolapse of the ciliary body or other part of the uveal tract, so that the divided lips of the sclera may be closely approximated. Scleral wounds should be closed by a suture through the most superficial portion, so that infection may not be carried down through the suture which is used to close the wound. The safest medicines to use in the conjunctiva are boric acid—saturated solution—and argyrol solution. In wounds of the central portion of the cornea, or any part away from the periphery, atropine may be used to dilate the pupil, and thus reduce its possible inclusion in the corneal wound. If the periphery is involved a miotic should be used.

There will be found cases in which the wound is so extensive as to necessitate the immediate enucleation of the eyeball. Again, the wound may be small; but the tension of the eyeball has become so greatly diminished through the loss of the vitreous that it would be inadvisable to allow the eye to remain.

There are cases on record in which the penetrating body has pierced both the anterior and posterior walls of the eyeball, being finally lodged in the orbital tissues to the rear of the eye. One can well imagine the havoc wrought as a result of this lesion, especially if the foreign body be infected.

As apparently trifling wounds of the eye may result in the destruction of the eye, it is hardly necessary to lay stress on the practice of thorough asepsis of the conjunctival sac and overlying structures, also that the instruments used about the eye be thoroughly sterilized.

Ocular Manifestations Produced by Gunshot Wounds of the Cranium. These injuries are well illustrated by a case reported by Ray.[2] A boy of 17 was shot with a 22-caliber rifle. He remained unconscious for several days. The bullet had penetrated the skull almost midline, about 1 cm. above the external occipital protuberance. There was a bilateral ptosis and a dilatation of both pupils with a sluggish response to strong light in both eyes. The retina and optic nerves of each eye appeared normal.

Roentgen-ray examination showed four fragments of the bullet. Fragment No. 1 was in the scalp at the level of the external occipital protuberance. Fragment No. 2, in the cranium, 1½ inches vertically above the sella turcica. Fragment No. 3, intracranial, lying 2½ inches above the external auditory meatus, and in the meridian line. Fragment No. 4, intracranial, 3½ inches above the external auditory meatus and 2½ inches to the left of the meridian line.

From this *x*-ray report it is evident that the fragments must have passed through the cortical visual areas, which lie in the posterior occipital lobes for the most part, along the calcarine fissure, and on to the posterior surface of the occipital lobes. Externally this area would

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(2) Cincinnati Jour. Med., Feb. 22, 1922.

extend about 1 cm. on either side of the median line, and from 1 to 2 cm. above the external occipital protuberance. It is to be remembered that the superior longitudinal sinus which broadens to form the confluens or torcular herophili lies just beneath this superficial area, usually a little to one side or the other of the median line. It is not likely that this sinus was injured, as an injury to any of the large sinuses causes an extravasation of blood which is so copious and rapid that the patient dies in a few minutes of shock. It is certain, however, that with such an injury a hemorrhage of moderate degree must occur.

That a marked improvement in vision has taken place is evidence that part of the initial blindness was due to hemorrhage in the region of the bullet's entrance, and with the gradual absorption of blood a return of vision resulted. The permanent destruction of the various parts of the field probably are due to actual damage to nerve tissue (Plate X).

On account of the very inaccessible location of the fragments, and as there was no sepsis, attempt to remove these was not considered. Convalescence was extremely slow. There was no evidence of vision for the first ten days. Consciousness was regained on the fourth day. The ptosis disappeared in about a week. Pupillary reaction was now more prompt. In about two weeks the boy was able to distinguish light.

The first record of vision was taken about eight months after the accident: O. D. V = 7/200; O. S. V = 1/200. One month later it was: O. D. V = 12/200; O S. V = 1/200. Fundus examination at this time shows a decided pallor of the left disc, right fundus normal. Gradual improvement has been noted from time to time until the present time.

Vision taken four months after this shows: O. D. V = 20/40; O. S. V = 20/40.

The patient was now able to read newspaper head-lines. There was great difficulty in walking, due to the restriction of the lower field of both eyes. The nature of the residual damage which is evidenced by the constriction of the fields, leaving moderately good central vision, is difficult to explain on an anatomic basis. This field seems typical of such cases. The part of the brain cortex which is thought to be devoted to the macular region lies in the center of the area striata. This would be about the point where the cortex bends into the calcarine fissure, and about 1.5 cm. above the external occipital protuberance. Along the optic radiation and the tracts, a similar relation of the macular fibers is maintained.

From the fact that there is no interference with accommodation, convergence or pupillary reaction, it is to be assumed that no damage has been done along the pathway of the primary neurons which extend from the retina to the thalamus, lateral geniculate and superior quadrigeminal bodies.

The End-Effects of Toxic Gases on the Eyes. L. Dor and Fouassier[3] have studied the effects of toxic gas on the eyes of a number of the war wounded. The lesions were especially conjunctival, the remnants of old burns produced by the action of toxic gases, yperite in particular. The disturbances consist in the persistence of abnormal vessels, new-formed vessels which are the vestiges of the repair work of the tissues injured by the burns produced by the gas. The accompanying illustrations (Plates XI to XIII) show some typical effects in eyes exposed to yperite.

Perforating Wounds of the Eyeball. A perforating wound of the eyeball presents to the oculist a serious condition requiring prompt treatment. Each injury of this kind carries with it the possibility of loss of vision or loss of the eyeball.

The following questions requiring solution in all per-

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(3) Clin. Ophtal., April, 1922.

forating wounds of the eyeball, are answered by E. S. Connell.[4]

1. Is there a foreign body in the globe?
2. Is sympathetic ophthalmia apt to develop?
3. Will enucleation be necessary?

From the anatomic and pathologic viewpoint we can best divide these injuries into two classes: (1) perforations into the aqueous chamber; (2) perforations into the vitreous body.

To determine the presence of a foreign body within the globe, we rely upon direct vision in those cases which belong to Class 1, and on the ophthalmoscope and *x*-ray for cases of Class 2. The ophthalmoscope is of use only in cases in which the foreign body has not become obscured by hemorrhage, cloudy media or exudates.

Class 1: *Involvement of the Aqueous Chamber.* The foreign body usually enters through the cornea or ciliary region of the sclera. It may lodge in the aqueous, iris, lens or pass into vitreous or entirely through the eyeball, lodging in the orbit. Maxted, in his report of cases occurring in the soldiers at the Military Ophthalmic Center in London, states that in seven of the 106 the foreign body had penetrated both walls of the globe and was lying in the orbit. None of the seven had to be excised, but vision was reduced to "fingers at 3 feet."

If the wound of entrance is large, loss of aqueous takes place with prolapse of iris and formation of anterior synechiae. Injury to iris is followed by free hemorrhage into the anterior chamber. If the lens is injured cataract develops, and, if the foreign body carries infection, pus develops in the anterior chamber.

Iritis with or without infection develops in all of these cases, if not promptly treated; as a result of the iritis, a plastic exudate is thrown over the anterior surface of the lens resulting in posterior synechiae with occlusion and seclusion of the pupil, in the more violent cases. There follows impairment and often complete loss of vision.

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(4) Jour. Mo. State Med. Ass'n., March, 1922.

The cases in which perforation takes place into the anterior chamber do not usually require enucleation, and do not develop sympathetic ophthalmia as frequently as those in which injury involves the ciliary region.

Class 2—Perforations into Vitreous Body: The inflammation begins in the ciliary processes and retina. These structures become hyperemic and throw out a serous exudate. If no pyogenic organisms have been introduced, and the exudate is small, a portion of the vision may be saved. Usually the exudate becomes organized and destroys retinal function. If infection takes place, abscess of vitreous develops which may be followed by encapsulation by a connective tissue membrane resulting in atrophy of the eyeball. On the other hand, the pus may increase in quantity until a panophthalmitis supervenes, the after-result being phthisis bulbi.

Treatment: Treatment is best understood if we group the conditions to be met as follows: (1) Care of the wound; (2) removal of the foreign body; (3) care of complications (traumatic cataract, plastic iridocyclitis, suppurative chorioiditis, panophthalmitis and sympathetic ophthalmia).

When the wound is so extensive that saving the eye is obviously impossible, primary enucleation is advised. Less extensive wounds are cleansed, iris excised when prolapsed, atropine instilled and ice compresses applied.

If the perforation is in the sclera it is closed by suture of the conjunctiva or by passing sutures through the external layers of the sclera. Porlapsed ciliary body and chorioid are not excised. Small wounds close without suture by cicatrization.

The foreign body if iron or steel is removed by the magnet: if in the anterior chamber, through the site of entrance; if in the vitreous through an incision in the sclera as close as possible to the foreign body. If the body is non-magnetic and in the anterior chamber it is removed with forceps through a corneal incision. If near the angle of the anterior chamber, it is best reached through a corneal incision about 3 mm. within the limbus made with the point of a keratome pointing toward the limbus and passing through the cornea at an angle of approximately 45 degrees.

A non-magnetic body in the vitreous is removed by passing forceps through a scleral incision if possible. Failure often occurs and if the eye does not tolerate the foreign body, secondary enucleation is necessary.

Traumatic cataract is a frequent complication, and if the rupture of the anterior capsule is extensive, lens particles escape into the anterior chamber causing secondary glaucoma, necessitating an extraction.

In all perforating injuries a violent reaction takes place and iridocyclitis with or without infection sets in unless treatment is started early. Iridocyclitis produces often extensive exudates in the vitreous, which ultimately become organized, shrink and produce atrophy of the eyeball. In such cases, secondary enucleation is advised, when the retina loses its function, that is, when light perception is destroyed and decrease of tension accompanies it.

Suppurative chorioiditis following a perforating wound demands enucleation. And the author now believes that panophthalmitis is best handled in the same manner. Because of the supposed danger of meningitis the question of enucleation in panophthalmitis has long been a subject for difference of opinion. Experiences during the war seem to establish the fact that enucleation is by far the best treatment, as meningitis is not apt to develop, and it shortens materially an otherwise long drawn out and painful condition.

In the survey of the work of the American Expeditionary Forces, printed in the *American Journal of Ophthalmology*, August, 1919, the statement is made that enucleation is preferable irrespective of the septic or non-septic condition of the eyeball. Furthermore Dorrieux holds that the operation of choice in traumatic panophthalmitis is enucleation.

Furthermore, the danger of sympathetic ophthalmia is not great if the ciliary region is not involved. Of the 106 cases of perforating wounds of the eyeball occurring in soldiers in the Military Ophthalmic Center in London reported by Maxted, there was but one case of sympathetic ophthalmia.

There are certain changes to be watched for or high signs in sympathetic ophthalmia as they have been designated: Failure of accommodation in the good eye, continual photophobia, prolonged cyclitis, and decrease in tension in the impaired eye, blood count showing increase in mononuclear cells (S. H. Browning).

Penetrating Injuries of the Eye by Steel Particles. Foreign bodies may enter the eye and come out again through natural causes, while others penetrate the eye and stay there. In cases of the latter variety, our greatest hope lies in the proper and judicious use of the electric magnet. F. Allport,[5] who has had a large experience in this field, describes the technique he has followed in the removal of particles of steel from the inside of the eyeball, in hundreds of cases.

Foreign bodies may enter the eye through the cornea, through the sclerocorneal juncture, or through the sclerotic, and these facts constitute the important features of this subject. Foreign bodies may be of all sizes and shapes. Particles of steel driven into the interior of the eye have been so small that Allport almost required a magnifying glass to see them; or, on the other hand, so large that it was a mystery how the eyeball could conceal them. They have been long and short, smooth and rough, and never any two just alike. Some objects merely pass through the corneal layers and drop into the anterior chamber, some are lodged in the iris, others in the lens, others in the vitreous chamber, some are tightly wedged into the sclera, and some pass clear through the entire eyeball and are lodged in the tissues of the socket back of the eyeball; all these things must

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(5) Illinois Med. Jour., July, 1922.

be taken into consideration, and each case must be studied by itself. When a piece of steel is in the anterior chamber, or iris, or lens, it can be easily seen, but when objects take refuge back of the lens they are frequently not easily discernible even with the ophthalmoscope. If the object is in the anterior chamber an incision through the cornea large enough to permit of its easy escape through the wound on to the magnet may be all that is necessary, especially if no infection or iritis follows. The same may be said if the foreign body is lodged in the iris, although under these circumstances, in drawing out the steel with the magnet, some iridic tissue will very likely to come with it. This is a danger that must not be overlooked, and too much magnetic force should not be applied under conditions of this kind.

If a little of the iris escapes it may perhaps be coaxed back into place again, but if it proves obstinate it may be cut off, thus making an iridectomy. A well-dilated pupil will sometimes disclose the foreign body in the anterior capsule or in the lens itself. Steel in this location can usually be withdrawn with the magnet, but not always, and some authorities advocate that, inasmuch as the lens is practically unsupplied with nerve tissue, if a foreign body is located in the lens it can be let alone, but with this view the author disagrees. One cardinal rule of great value, is to make the incisions amply large enough to allow of the easy exit of the steel. This more than anything else avoids unnecessary traumatism.

One of the first things we have to do in dealing with intra-ocular steel particles is to have recourse to clear and intelligible *x*-ray pictures. Patients are not reliable witnesses under these conditions. Most men who have received injuries claim that there is nothing inside of the eye, but no attention is paid to opinions of this kind. Not all *x*-ray pictures are reliable, though as a rule dependence can be placed upon clear *x*-ray pictures; but they must be clear and good, and taken by a man who understands his business. Two clear pictures are taken, one a profile picture and the other a front-view. If these pictures are good they will be a sufficient guide as to the locality of the foreign body without going through all of the trouble of what is known as "localization." It is not necessary, although perhaps desirable, to get a strong magnet directly over the site of the steel. The interior of the eyeball is not a *vast* place after all and if a magnet is going to draw a piece of steel from the interior of the eye, it will do so if placed somewhere near the location of the foreign body.

Operative procedures are divided into two parts, namely, foreign bodies located in or anterior to the lens, and foreign bodies located posterior to the lens. In foreign bodies located in or anterior to the lens, it is advisable to remove the foreign body by what may be called the anterior route, that is, through the cornea, but where foreign bodies are located posterior to the lens it is better to make an opening through the sclera and remove the foreign body through the posterior route. This view was at first scorned by most ophthalmologists, who believed in following the rules of Haab, to remove all foreign bodies through the cornea, but now the rule of removing foreign bodies that are posterior to the lens through the sclerotic is quite generally endorsed. A single exception to this rule should be made and that is, if a patient comes within a few hours after he has been injured, and the steel has entered through the cornea and perforated the lens, thus producing a cataract, and is lodged in the vitreous chamber, with as yet an unhealed wound, this man is given an opportunity of having the steel removed through the avenue of ingress. But if he comes after the wound has healed, the steel is removed through the posterior route. If we remove steel through the anterior route we should do whatever seems necessary under the circumstances. If there is a prolapse of iris it should be cut off; if there is a cataract as much of it should be removed as can be removed in safety.

Some reasons for removing steel, located posterior to the lens, through the posterior route are as follows: In the first place it must be remembered that there are very few genuine Haab magnets in this country. A genuine Haab magnet is a double-ended affair, setting upon a standard, and extremely powerful. The magnet is never removed from the standard; the patient sits in front of the magnet and the head is moved in various directions in place of the magnet being moved in various directions. Inasmuch as there are so few of these magnets in this country there is very little use in giving instructions as to what to do with a Haab magnet. There are various magnets, that are erroneously called Haab magnets, that are put upon the market by electric concerns, but they are not really Haab magnets. The genuine Haab magnet is capable of drawing small particles of steel from the extreme posterior portion of the eyeball into the anterior chamber, but the magnets that American ophthalmologists use are frequently not capable of so much drawing power.

It is almost amusing, says Allport, to read the descriptions of how a piece of steel can be drawn by the magnet along the floor of the vitreous chamber and then coaxed carefully along the surface of the ciliary body and through the ligament of the lens into the space back of the iris and then raised up as high as the pupil and drawn through the pupil and dropped into the anterior chamber of the eye, and then taken out by an incision in the cornea without injuring the lens, or anything else for that matter. It is quite evident that this can only be done with very small pieces of steel, and with pieces that have no particularly sharp corners to catch, pull and tear the delicate structure of the eyeball as it comes along. Steel objects of any particular size will have to be drawn directly through the lens itself, thus producing a cataract, if a cataract has not already been produced by the accident itself. Objects located in the vitreous chamber of the eye are better removed by an opening through the sclerotic coat of the eye. Much less damage is produced than if we endeavor to pull a ragged, jagged piece of steel of average size through the delicate anatomic structure in the anterior portion of the eyeball. This operation is liable to produce hemorrhage in the vitreous chamber, detached retina, atrophy of the chorioid, etc., but all things considered, this is the safer route of exit of objects located in the vitreous chamber.

In performing this operation the incision is made in the quadrant of the eye nearest to the foreign body, as indicated by the *x*-ray pictures. In other words, the incision is made either between the external and inferior rectus muscles, or the inferior and internal rectus muscles, or between the internal and superior rectus muscles, or between the superior and external rctus muscles. A piece of the conjunctiva is picked up with forceps near the sclerocorneal juncture and an incision is made with a pair of scissors. A triangular flap of the conjunctiva is made and laid back, thus disclosing the sclerotic coat of the eye. A Graefe cataract knife is plunged through the sclera, making an incision parallel with the fibers of the sclera from before backwards, avoiding the ciliary processes. The size of the incision of course is graduated according to the size of the object, as indicated by the *x*-ray picture. The strongest end of the magnet is then placed at the opening and the current turned on. If the object does not present readily the current is turned on and off several times so as to jerk the object loose. The magnet is directed, or aimed in the direction of the foreign body as near as possible; in this way the object is more apt to come out end to end. If compelled to introduce a magnet point inside of the eye, it should never be done more than twice, as it is preferable to leave the foreign body than to destroy an eye by meddlesome surgery.

After the operation is finished, the sclera is not entered, as this membrane is so tough that considerable vitreous is liable to be lost in suturing it, and beside that we leave inside of the eye by means of the suture a particle of silk thread that is liable to produce infection. The conjunctival flap is simply pulled over the opening and closed with two sutures, one on each side.

It must never be forgotten, says Allport, that the end-results in cases of this kind are not always good, no matter how smooth the operation may be nor how soon after the invasion of the foreign body the operation is performed. Intra-ocular changes, panophthalmitis, cataract, iritis, sympathetic ophthalmia, etc., may follow, and ruin what appears to be a favorable operation.

The hand magnet invented by Sweet of Philadelphia has been employed by Allport for many years. While it is a hand magnet and can be conveniently manipulated with accuracy and delicacy, it is nevertheless very powerful.

Pathology and Pathogenesis of Sympathetic Ophthalmia. This forms the subject of an investigation by E. Redslob.[6] Some authors such as Poulard think evisceration of the globe sufficient to prevent the appearance of sympathetic ophthalmia; others such as Morax think that enucleation within the fourteen days following infection of the ocular globe is the only efficacious means of preventing it.

Redslob thinks that the fear of sympathetic ophthalmia amounts to a regular phobia and that ophthalmologists too readily accept the transmitted opinions regarding this condition as facts. Redslob has himself studied the question from the anatomic point of view, examining sections of eyes enucleated for fear of sympathetic ophthalmia to find how often this fear was justified by the actual existence of such lesions. From 1909 to 1920, 660 cases of perforating traumatisms were treated at the ophthalmologic clinic of Strasburg.

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(6) Ann d'ocul., September, 1921

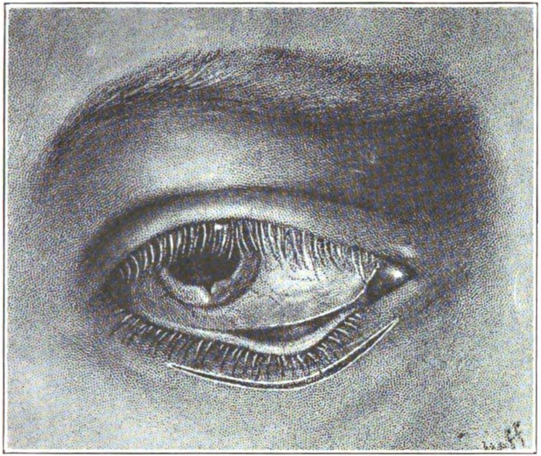
Enucleation was done in 250 of these. All these globes were histologically examined. In ninety-nine or one hundred of these cases the injured eye was blind.

The accidental traumatisms which happen to children are those which most frequently necessitate a preventive enucleation. Workmen who are daily exposed to perforating injuries of the ocular globe run less risk than children who are innocently injured.

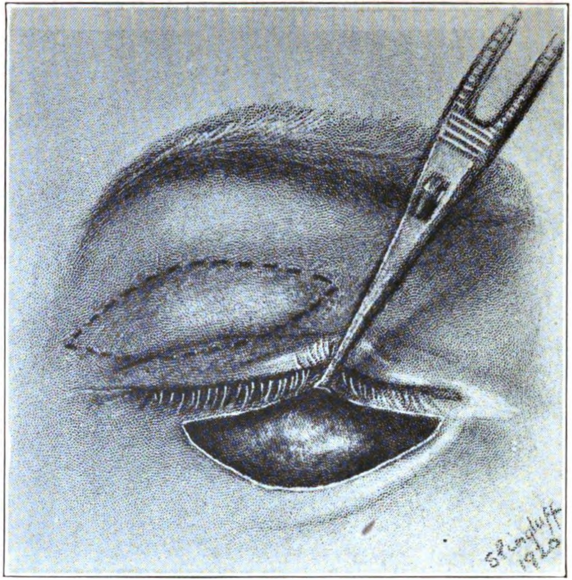
Sympathetic ophthalmia is diminishing. In 1905 Fuchs found 14 per cent. of sympathetic ophthalmia in 200 enuncleated eyes. Redslob found only 3 per cent. in 1921. These statistics are based on the accidents of peace time.

From the pathogenic point of view it appears that the microbes of sympathetic ophthalmia are saprophytes of the conjunctival sac. These germs appear to penetrate into the interior of the globe by the perforated wound, where they form a focus of inoculation. After a certain incubation period they penetrate into the two globes almost at the same time, through the short posterior ciliary arteries, and cause lesions of the chorioid, or through the long ciliary arteries and attack the anterior uveal regions. This hypothesis appears justified by the following findings: (*a*) sympathizing lesions are never seen before the other eye is itself attacked by sympathetic ophthalmia; (*b*) in cases in which the sympathetic infection appears years after the traumatism, very frequently recent lesions are found in both eyes; (*c*) the so-called sympathizing lesions show their maximum development in the posterior part of the chorioid, and regress toward the anterior part. There is no such thing as "sympathizing and sympathetic," both eyes are "sympathized."

PLATE XIV.

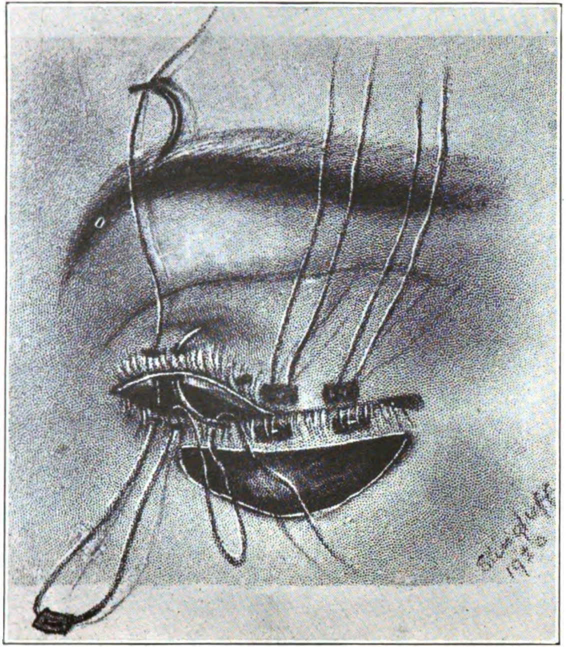


A.—Operation for cicatricial ectropion of lower eyelid; primary incision parallel to lower lid margin.

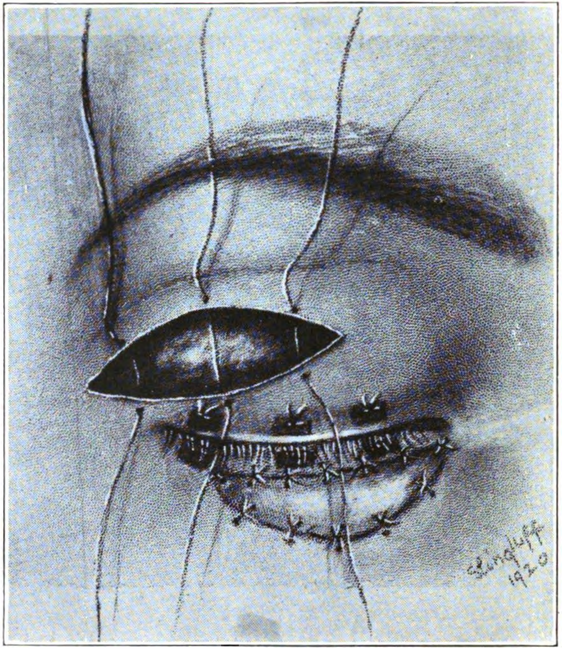


B.—Dissection in lower lid completed; graft from upper lid outlined.—Wheeler, page 153.

PLATE XV.

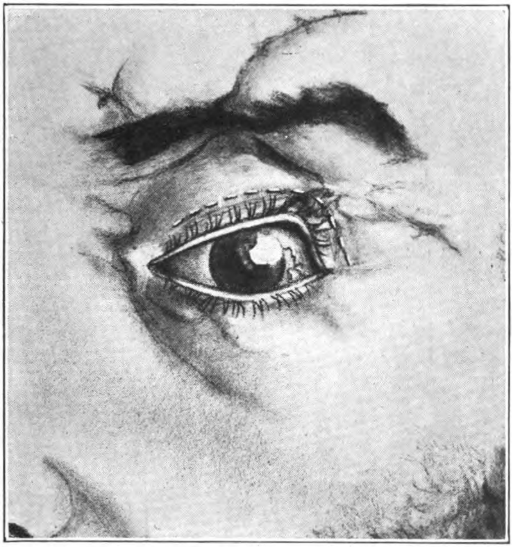


C.—Preparation of lids for the intermarginal adhesions; rectangular denuded areas of upper and lower lid margins held in apposition by sutures tied over small rubber plates.



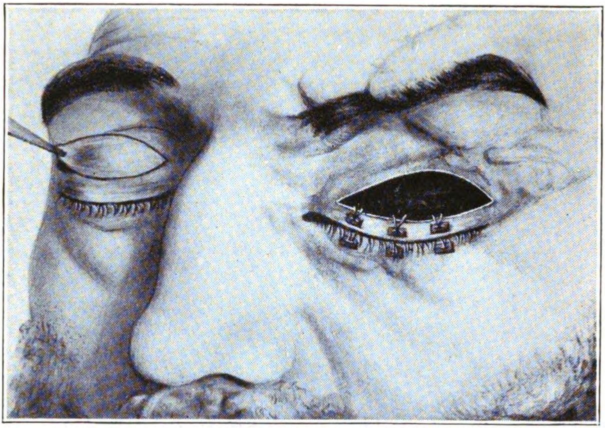
D.—Skin graft from upper lid sutured in place in lower lid; sutures ready to tie to close wound in upper lid.—Wheeler, page 153.

PLATE XVI.

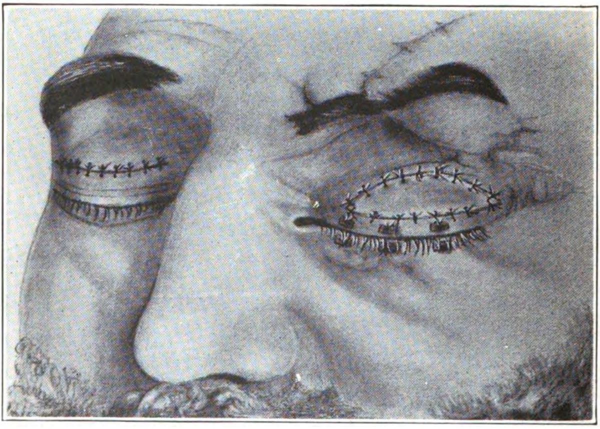


E.—Operation for cicatricial ectropion of upper eyelid showing deformity of left upper lid, with dotted line to indicate position of primary incision.—Wheeler, page 153.

PLATE XVII.



F.—Dissection in left upper lid completed, and lids sutured together at denuded areas of upper and lower lid margins; dermic graft being taken from right upper lid.



G.—Graft from right upper lid sutured in position in left upper lid; wound in right lid closed with sutures.—Wheeler, page 153.

Correction of Cicatricial Ectropion by Use of True Skin of Upper Lid. J. M. Wheeler[7] describes the method, original with him, of operating in suitable cases of cicatricial ectropion by using a detached graft of skin from the upper lid for ectropion of the lower lid, or for ectropion of the fellow upper lid. This procedure he believes to be the best yet devised, and for ease of taking and handling the dermis, and for beauty of result, no other graft can compare favorably with it.

The technique of the operation is as follows:

Cicatricial Ectropion of the Lower Lid: This is far more common than that of the upper lid. That full correction of this deformity has always been considered difficult there can be no doubt; but we should aim at absolute correction, even to the proper conduction of the lacrimal secretion, if the drainage system is still intact.

The primary incision (Plate XIV, A) should be parallel to the distorted lid margin. Cicatricial tissue should be so thoroughly and painstakingly removed so that there will be no tendency of the lid to evert or lop, and that there will be scarcely more than normal resistance to upward traction at the lid margin (Plate XIV, B). In making the preparatory dissection, the tissues should not be handled roughly. Artery clamps should not be used unnecessarily, and no ties should be used on bleeding vessels.

Either two or three firm adhesions between the upper and lower lids are made by dissecting off epithelium at corresponding positions on the upper and lower lid margins and carrying mattress sutures through the little raw surfaces. They are passed through small plates of rubber (cut from sterile rubber tubing) overlying the skin of both upper and lower lids near their margins (Plate XV, C). These sutures are tied snugly to insure

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(7) Jour. Amer. Med. Ass'n., Nov. 19, 1921.

firm apposition of the opposing raw surfaces. Union of these raw surfaces causes the formation of adhesions for the support of the lower lid. Later, these adhesions stretch somewhat and are covered with a growth of epithelium. This stretching allows of very slight separation of the lids, so that the patient can see between the margins, a thing to be encouraged as elevation of the upper lid stretches the lower. With this in view, it is well to avoid making an adhesion directly in front of the pupil.

Removal of the True Skin Graft From the Upper Lid: This is very simple as compared with the dissection of a dermic flap from the arm, thigh or elsewhere. Almost no allowance need be made for contraction. In fact, a graft exactly the dimensions of the raw surface to be covered will answer. This graft can be taken from either upper lid, or, if need be (if each upper lid will afford skin) two grafts may be taken to cover the raw surface. It is not necessary to take more than one for a single exposure of raw surface. From the upper lid of a young adult, a piece of skin measuring from 20 to 25 mm. wide and 50 mm. long can be taken. From an elderly person, usually greater width can be obtained without danger of lagophthalmos. In removing the graft, a grasping forceps of any kind should not be used for fear of bruising the graft. Outlining incisions are made through the dermis of the upper lid. A fusiform or semilunar shaped graft will almost always be needed, and a graft of this design is convenient to take. A cataract knife is slid under the skin from the lower incision to the upper. The knife is carried by careful sliding motions nearly to one end of the graft. Then it is turned about and carried to the other end, freeing it. The piece of skin is picked up with the fingers and set free.

By placing the graft, epithelial surface downward, on a pad wet with warm (body temperature) normal salt solution, any fragments of subcutaneous tissue can be quickly snipped off with the scissors. This is not a tiresome process as it is in the case of an arm graft. Fine silk sutures (No. 1, twisted) impregnated with paraffin are used to stitch the graft in position (Plate XV, D). The ends should be secured first, and then the margins should have as many sutures as may be needed to hold them in place.

No undermining is necessary in order to bring the wound edges together in the upper eyelid. The raw surface is easily closed over by fine silk sutures, and there need be no fear of subsequent opening of this wound.

Cicatricial Ectropion of the Upper Eyelid: If only one upper lid is deformed, a piece of skin from the fellow lid makes an ideal graft. Obviously, skin should never be taken from a lower lid for an upper one. The technique of the operation is the same for the upper lid as for the lower. Plates XVI and XVII show the steps.

Dressing: The graft should be covered with rubber tissue, having the slightest smear of sterile petrolatum. It is preferable to put the tissue on in two layers with the grains running at right angles, to guard against the possibility of perforation through separation of the tissue fibers. The rubber tissue will prevent the skin graft from getting dry. "Greasy tulle," as recommended by Morax is not suitable for covering this delicate graft. If a covering other than rubber tissue is chosen, it should be of smooth surface, pliable and without perforations. Over the tissue, gauze fluff is packed and secured firmly by adhesive plaster, and then by pressure bandage, which in turn should be secured by adhesive plaster. It is well to put a separate dressing over the other eye, to be left for two or three days, and then to be cut down without disturbing the main dressing and bandage. This should be left for six days, at the end of which time it is removed with the utmost care, and the graft painstakingly cleansed with damp (not wet) boric acid sponges, and all sutures taken out.

At the first dressing the grafted skin will appear pink, not anemic like a graft from the arm. The outlines of the beautiful inlay are hardly seen even at the first dressing. Rubber tissue, gauze dressing and bandage, changed every two days, are continued for another week; then dressing is no longer necessary, and the graft is kept smeared with a little sterile petrolatum.

About three weeks after operation, it is prudent to start massage with petrolatum. This is kept up daily for several weeks. The adhesions between the lids should remain for at least three months. They should be left until all tendency to malposition of the lid has passed. They are then cut with the scissors, and no deformity results from them.

If properly handled, this lid graft will "take." It will match in color, texture and pliability almost from the start, as no other graft will. It will not grow hairs, and will not be a disfigurement in any sense. Furthermore, one may remove this graft of skin from the upper lid with the assurance that no deformity will result. A few weeks after operation, there is nothing to arouse the suspicion that the upper lid has been robbed of skin.

Plastic Repair of the Eyelids by Pendunculated Skin Grafts. The author of this article is G. H. Cross.[7] Plastic surgery of the face, especially of that part bordering on the orbits, rightfully the domain of the ophthalmologist, received during the World War a tremendous impetus, due primarily to the large number of injuries involving the eyes, nose, and orbits, which were received by the men in that conflict. This invaluable experience gained by the ophthalmic surgeon will, without a doubt, find a fruitful field of usefulness in the treatment of those post-war cases of injury, incurred in industrial occupations, and other peace time pursuits. These cases, while not precisely similar to war injuries, are governed in the manner of their correction by the same general surgical principles. The restoration of the eyelids and

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(7) Jour. Amer. Med. Ass'n., Oct. 15, 1921.

the socket has a most important bearing on the mental attitude of the patient, and means much to his or her appearance, both cosmetically and practically. A person with an empty, deformed socket, unable to retain an artificial eye, or with no eyelids, or with only part of an eyelid to cover a retained globe, has greatly limited opportunities in securing industrial employment; and embarrassment arising from the gazes and questions of the curiously inclined public cause him to shun society and seek seclusion.

There are three general subdivisions of lid restoration, which may be classified thus: (1) pedunculated, autogenous grafts; (2) free dermic, or Wolff, grafts; (3) epidermal or Thiersch grafts. The latter type, used after the method of Esser, of Holland, and Gillies, of England, has a most valuable use. It is undoubtedly the best method of treating those cases of severe burns, with glazed, parchment-like skin surface, and cases of ectropion due to contracture of scar tissue, or when it is impossible to use a pedunculated graft, when indicated, because of scars, or inability to obtain a vascular supply to the graft. Cross describes the technique of the method used in the practical application of the pedunculated skin graft in the reconstruction of the eyelids. This type of graft is very successful in facial work, owing to the excellent arterial supply from many sources, which permits the selection of several different locations from which to obtain tissue to rebuild the eyelids. First, with the base of the flap at the external canthus, lid tissue may be obtained from either the temple, eyebrow, scalp or cheek. Second, with the base over the nose, the forehead can be utilized, and employing the side of the nose as a base, a flap may be shifted from one eyelid to the other on the same side. Third, with the base on the neck, the skin from the chest can be utilized, tubing the pedicle of the graft; this method was devised by Major Gillies.

Before undertaking the actual plastic transplant, there are a number of important underlying factors to be considered, which if neglected are likely to spell failure, no matter how skilfully or carefully the surgery may be performed. It is essential that sufficient time shall be allowed to elapse, following the primary repair, in order that all shrinkage and contraction of scars shall have ceased and the injured parts restored to their normal tone.

Neglect of this point explains the failure of incisions to heal kindly, and the failure of the transplanted graft to accomplish its purpose, owing to the secondary contraction, which so alters the size and shape of the area to be covered that the graft as planned is insufficient for the purpose. In all cases involving the lachrymal area, the removal of the lachrymal sac should be the first step undertaken; this greatly lessens the danger of the loss of the graft by infection, which so often lies dormant in the lachrymal sac or canal, only to flare up with amazing rapidity and destroy all our plastic repair. It is also necessary to visualize the change in the shape and position of the area from which the graft was removed, because it is quite as important to cover this area as the area for which the surgery was undertaken. We can not afford to distort the eyelids or the corner of the mouth, nor do we wish to bring the hair line of the scalp down to the eyebrow. If one has the time and facilities, much can be learned by experimenting with the intended grafts, cut from a gelatin-faced cast, made of a plaster-of-Paris base, with the face composed of a gelatin compound known as Henning's paste. The general surgical principles involved are outlined in the description of the technique employed in the first case, while the many variations and modifications will be discussed as they arise in the other cases (Plate XVIII).

Cross says that if photographs were taken today the end-results would show much greater improvement than the accompanying illustrations (Plates XIX to XXII), which were of necessity taken shortly after the operation had been completed, and before the men were transferred to convalescent centers, to provide the much needed room for the unoperated cases from overseas. Then too the fitting of artificial eyes was limited to a selection from the stock on hand; the government did not employ artisans to make eyes to order. Massage was most helpful in softening and eliminating scars; many of the patients were greatly improved in appearance following a supervised course of treatment in the department of physiotherapy.

The accompanying illustrations are photographs of soldiers operated on by the personnel of the ophthalmologic service at the U. S. Army General Hospital, No. 11, Cape May, N. J. The excellent schematic drawings, descriptive of these operative procedures, were made by the members of the art staff of the hospital. They clearly and accurately depict the various stages of the operations, as they were sketched at the operating table. These men were all injurd by machine gun, shrapnel or fragments of high explosive shells, and the primary surgery had been completed from two to eight months prior to starting the reconstructive work.

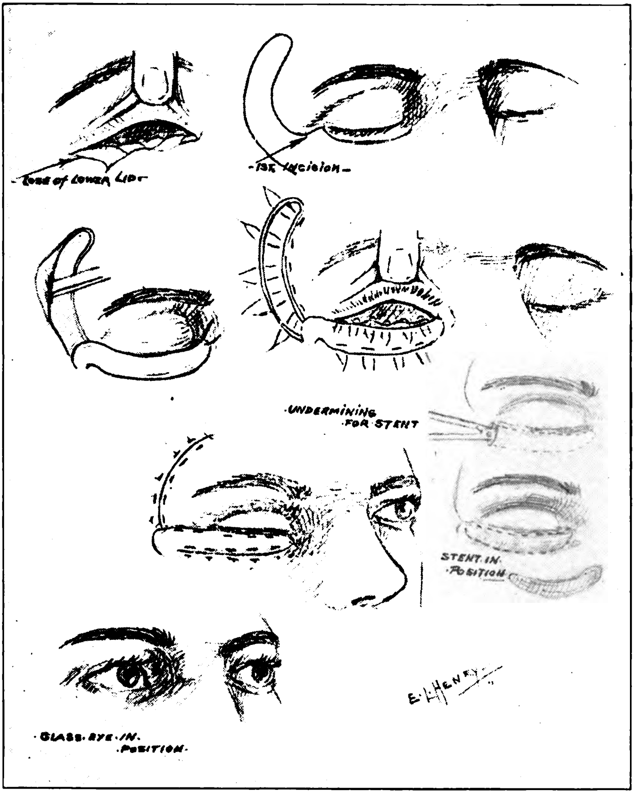
CASE 1.—S. H., aged 30, injured Oct. 9, 1918, was operated on April 17, 1919. This case, illustrative of the first method, is one in which the eyeball and the entire lower lid were lost following injury by machine gun bullet. The mucous membrane was drawn over the outside surface by the resultant scars and allowed the secretions to drain over the cheek, thus preventing the retention of a prosthesis. In this case, a pedunculated temporal graft was used, the temporal artery in the base being employed as the blood-supply.

Technique.—Following the extirpation of the sac the edges of the lower lid and conjunctiva were freed from the scar, and the edges were dressed up to determine the size and shape of the graft required. Then, from a piece of rubber tissue a model of the graft was cut, allowing a good margin for shrinkage. With this form, the best site for the graft was tried out. In this case the temple was selected; the graft was marked out with the point of a knife, dissected and swung into place. It was sutured with interrupted silk sutures, or better, mattress sutures, with a continuous overcast suture to approximate the edges. The denuded area from which the graft had been taken was covered by undermining the surrounding skin well back, drawing the edges together, and suturing with silk, horse hair, and silkworm gut. In some cases, it is best to cover in the denuded area first, and suture the graft afterward. The base of the graft has to turn on its own anchorage; therefore it is important to plan very carefully its position, keeping it as close to its new bed as possible, and avoiding too great an angle to prevent puckering of the skin. The tip of the graft should be made blunt and rounding, since then it is much less likely to slough.

Suturing is important, not so much as to the material used as to the method of using it, aiming to interfere as little as possible with the circulation of the flap. A most important consideration is the base line of the flap. One should avoid having too much tension here, or the circulation of the entire flap will be impeded and disaster will result. The mattress suture method of wound closure, championed by Dr. G. M. Dorrance, proved very successful in its lessened interference with the circulation of the flap, and was a most effectual means of preventing depressed scars, which are to be studiously avoided in plastic work of the face.

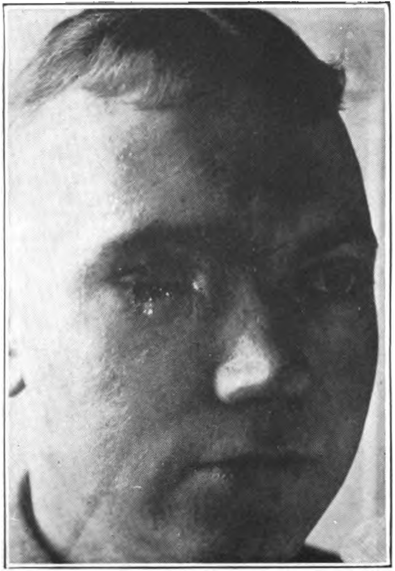
This pedunculated flap supplied the tissue for the outer surface of the lid, while the inner surface was obtained by an Esser tunnel, on May 13. That this was too soon after the lid graft was demonstrated at the operating table and during healing. The final picture of this patient (Plate XIX) was taken shortly after the operation was completed, and does not do full justice to the method of procedure. When the patient was

PLATE XVIII.

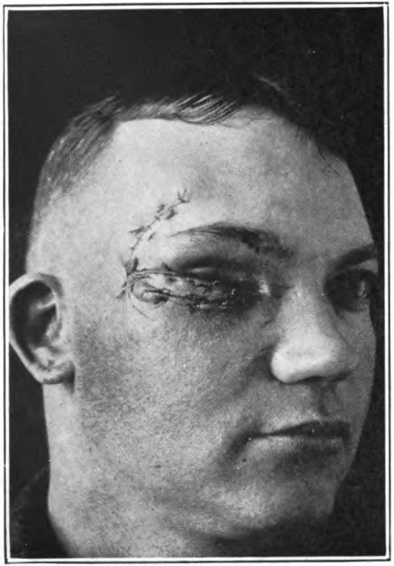


(Case 1).—Schematic drawing showing restoration of lower conjunctival cul-de-sac by a pedunculated flap graft following an Esser inlay.—Cross, page 156.

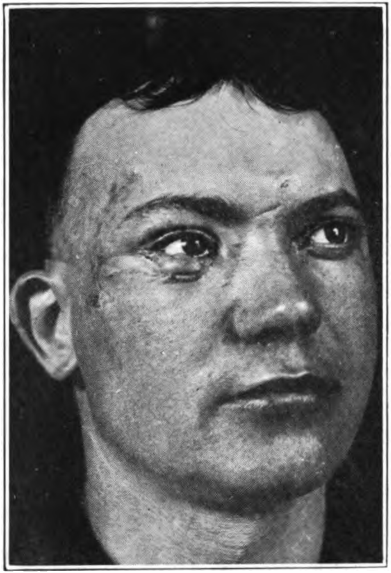
PLATE XIX.



(Case 1).—Absence of lower lid with discharge of tears and exposure of conjunctiva.

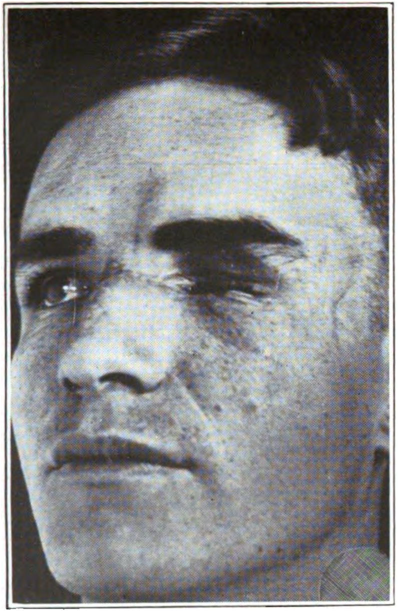


(Case 1).—Pedunculated graft sutured in place by mattress suture and interrupted sutures of silk.

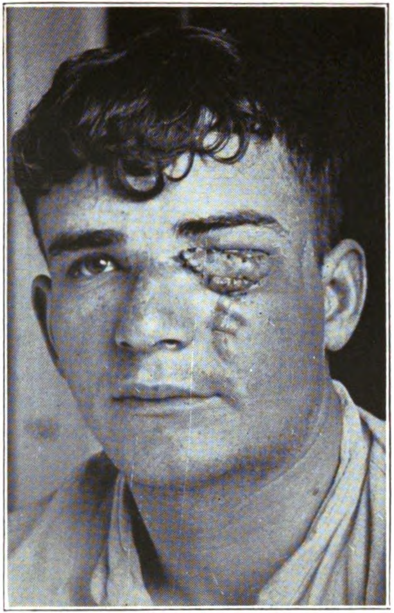


(Case 1).—Immediate result after Esser inlay: tissues swollen before toning down by massage; artificial eye held in new lower cul-de-sac by a new lower lid.—Cross, page 156.

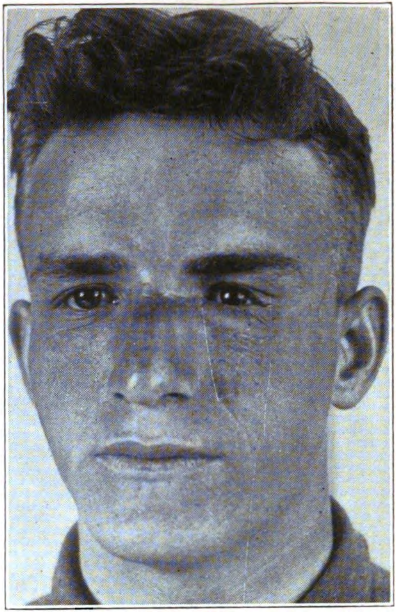
PLATE XX.



(Case 2).—Absence of left eye: Fragment of high explosive shell entered temple (at site of scar), destroyed eye and inner two thirds of lower lid, and injured bridge of nose.

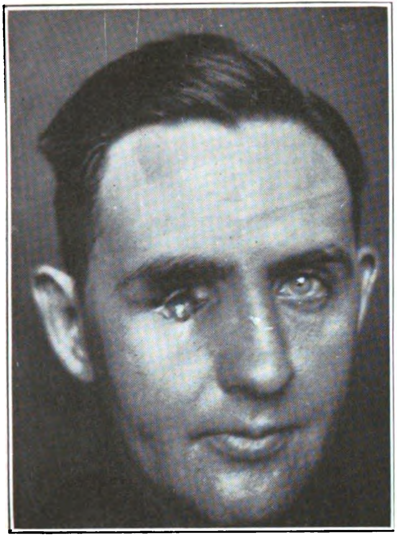


(Case 2).—Flap sutured in place, swelling indicating infection; cheek sutures of silkworm gut.

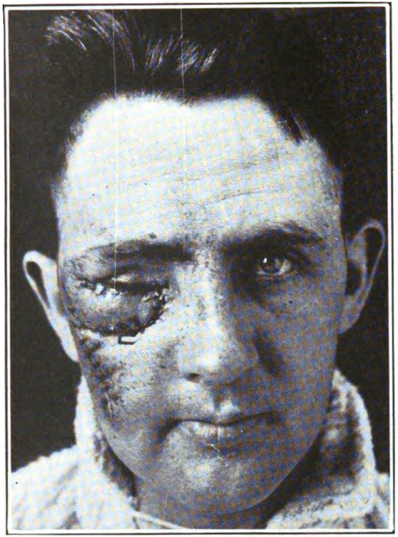


(Case 2).—Final result at time of patient's discharge; no bad results from the infection; artificial eye in place.—Cross, page 156.

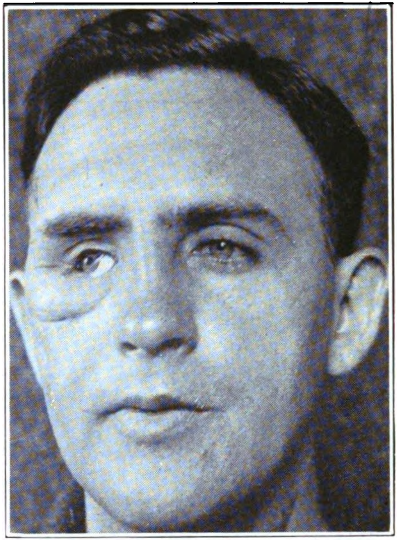
PLATE XXI.



(Case 3).—Loss of right eye, contracted socket and loss of lower lid; injury by machine gun bullet which passed through right eye, ethmoid and maxillary sinus, hard palate, and out the left side of the neck.

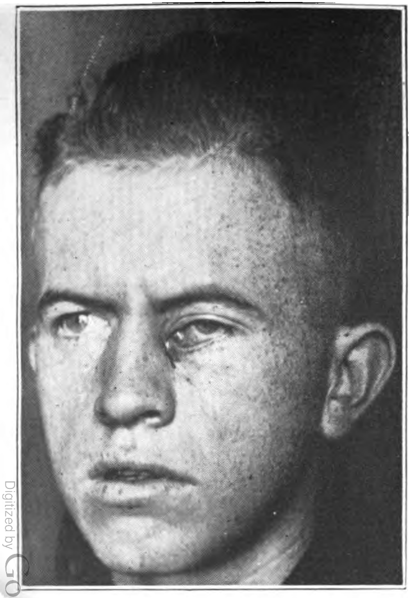


(Case 3).—Pedunculated flap from the cheek sutured in place (first dressing); cheek sutures of silkworm gut, flap sutures of black silk.

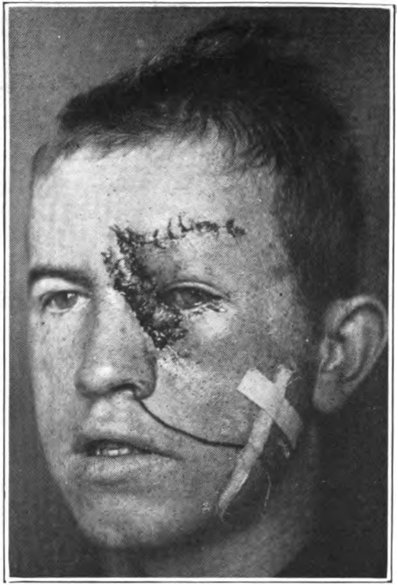


(Case 3).—Case not completed, artificial eye in place following Esser inlay; scar on neck shows exit of machine gun bullet, which entered through the right eye. Layer of fat to be shifted from under flap to fill depression over antrum was the next contemplated procedure.—Cross, page 156.

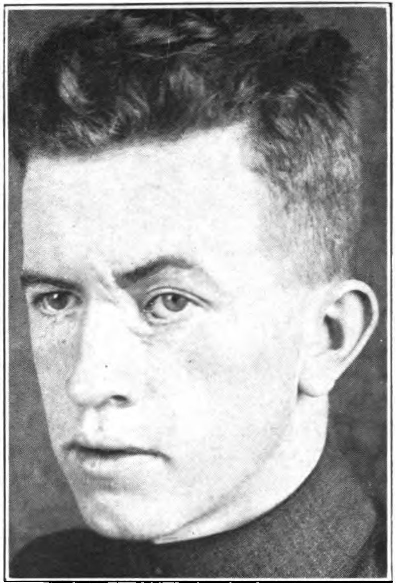
PLATE XXII.



(Case 4).—Sinus at base of bridge f nose, ectropion of lower lid, disortion of upper lid by scar tissue, ollowing injury by fragment of hrapnel or high explosive shell. ecretions escaped through sinus hen blowing nose.



(Case 4).—Pedunculated forehead graft sutured in place, covering sinus and relieving distortion of upper lid and ectropion of lower lid. Black silk cord is fastened to gauze plug in ethmoid defect. Photograph taken at first dressing.



(Case 4).—Final result showing the cosmetic result that was obtained. No attempt was made to replace the base of the flap.—Cross, page 156.

last seen, the swelling in the center of the lower lid was greatly lessened.

Case 2.—H. C. K., aged 23, injured Nov. 6, 1918, was operated on Feb. 18, 1919. This case, in which there was loss of the inner portion of the lower lid, along with destruction of the eyeball, is interesting for several reasons (Plate XX). It illustrates how necessary it is at times to do so much in order to accomplish apparently so little. The loss of the lid border in this case was sufficient to prevent the wearing of a prosthesis, so the new lid was supplied by means of a cheek pedicle graft. During the operation, in suturing the graft well into the inner canthus; the lachrymal duct, or canal must have been entered since on the second day there were indications of trouble. The flap was infected, and the leukocyte count was 38,000. This was a most unexpected complication, though productive of no bad results. Owing to the excellent and untiring care of the nurses, in the use of *large, hot,* normal salt compresses, kept hot night and day, the graft was not lost, with the very happy result seen in Plate XX. An important factor in this result was the use of heavy silkworm-gut sutures to coapt the edges of the area from which the graft was removed. They held perfectly until the wound united. There was a surprisingly small amount of scarring in this case, and there is no distortion of the mouth.

Figure 14 is a diagram of the technique of the restoration of the lower lid by the pedunculated cheek graft.

Case 3.—H. C. S., aged 28, injured July 18, 1918, was operated on April 1, 1919. In addition to the loss of the middle of the lower lid of the right eye, this soldier also had a contracted socket and loss of bony tissue as shown by a marked depression beneath the socket. This followed injury by a machine gun bullet, which after destroying his eye passed down through the hard palate and mouth and lodged in the left side

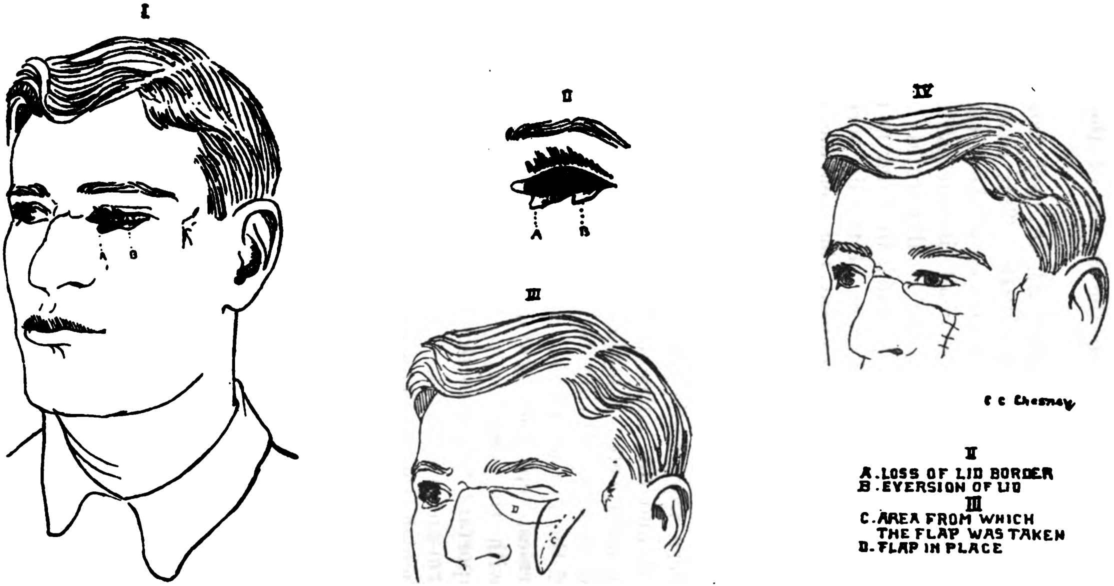


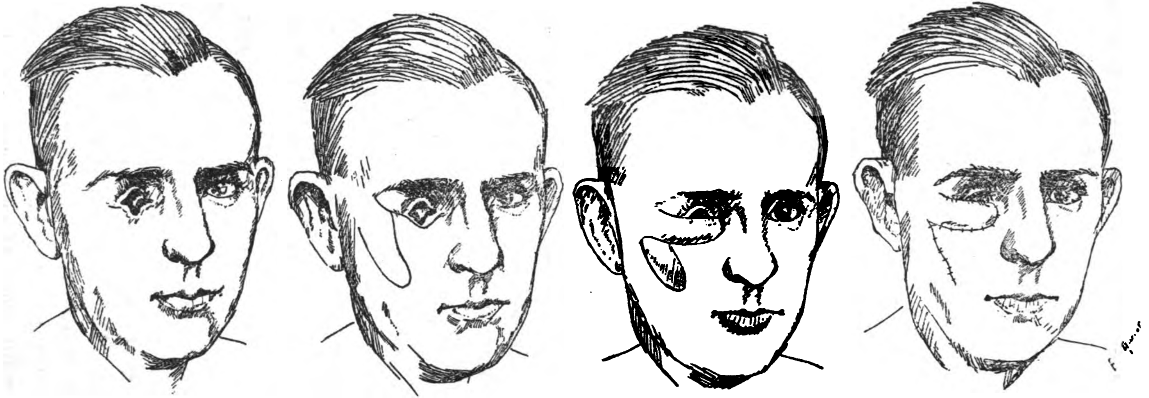
Fig. 14 (Case 2).—Schematic drawing of restoration of lower lid by a pedunculated cheek graft (Cross).

of the neck just under the skin, being removed by the fingers without operation. The wound in the neck is clearly shown in the last picture.

Operation.—In this case, the procedure was similar to that in the first one, in that it was also preliminary to an Esser tunnel to form a new lower cul-de-sac. The cheek was selected in this case in order to obtain a graft thick enough to build up the depression over the antrum. Care must be taken to avoid the whiskers if possible, also the salivary duct. On May 1, one month later, an "Esser tunnel" operation was performed, and it was the intention later to open the lower incision of the graft and turn a layer of fat from under the graft down under the skin of the face to fill up depression. Unfortunately this case was not completed when the hospital was closed (Plate XXI and Fig. 15).

CASE 4.—M. G. S., injured, July 15, 1918, was operated on Jan. 22, 1919. The defect of the eyelids and nose was caused by a piece of shrapnel or high explosive shell, which destroyed the tissues and bony covering of the anterior ethmoid cells. This condition at the time of operation was very annoying, owing to the discharge of secretions from the nose through the sinus in the ethmoid region, the marked ectropion of the lower lid, the distortion of the upper lid due to scar contraction, and in addition, the constant overflow of tears. This case is of interest, as it is one of the few in which the eyeball escaped destruction following severe injury to the orbital tissues (Plate XXII).

Operation.—First, the scar was dissected out and the tissue freed from its bony attachment. This allowed the lids to be restored to their normal position. Then a plug of sterile gauze, tied to a strand of heavy silk, was pulled in through the wound until it blocked the bony opening. This prevented the secretions from the nose gaining access to the under surface of the flap. Then the opening in the bone was covered with a thin sheet of paraffin wax, after which a rather wide graft



Before operation.

Line indicates incision for flap.

Flap in place which pushes up mucous membrane to deepen socket and form new lower lid.

Flap in place showing sutures.

Fig. 15 (Case 3).—Schematic drawing of pedunc to an Esser tunnel to form new lower cul-de-sac (Cross).

was swung from the forehead, so that in addition to covering the sinus, it would push up the border of the lower lid, correcting the ectropion, and at the same time relieving the tension on the upper lid. The wounds healed by first intention, after which the plug was pulled out through the nose. No attempt was made in this case to readjust the base of the flap. There was no distortion of the bridge of the nose or malalignment of the eyebrows.

Reconstruction of the Orbital Cavity. F. Terrien,[8] after a careful prior aseptic treatment of the field of operation makes his incision transversely from one canthus to the other along the site of the former palpebral slit. The two lids are detached from the subjacent plane, taking care not to include more than the tissues proper. By the careful dissections of the superior and inferior lids, as far as the orbital edges; the orbital cavity is vivified and ready to receive the graft, the bed of the graft being first prepared by excising all cicatricial and granulation tissue. Traumatism to the tissues by irritant solutions or by instruments will be reduced to the minimum; any inequalities of surface should be remedied by excisions or fine sutures of the edges. A wax model of the cavity is then made and any surface inequalities removed from it. A skin graft is cut from the arm or preferably from the thigh and wrapped around the wax mold fitted snugly to it and trimmed, the bleeding surface being outside and so arranged that the edges come together at the site of the former palpebral slit. The skin covered model is then inserted in its orbital bed and a dressing applied, which, in the absence of pain and reaction, is not removed for four days and then only superficially.

The wax mold is removed only after fifteen or twenty days. There are often adhesions which render the removal painful and which must be sectioned under cocaine. Some autoplastics may be necessary later on.

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(8) Paris méd., Feb. 25, 1922.

Transplantation of Animal Eyes. The functional value of transplanted animal's eyes is described by T. Koppanyi[9] who states that while a certain amount of success has been obtained in transplantations from animal to animal no functional results have up to now been obtained in transplantations from animals to the human species. Koppanyi transplanted entire eyes in the orbits of blind fishes, reptiles and rats. Corneal reflexes were found to exist after from seven to eight days; the retinal vessels appeared filled; and circular grey-white bands were visible between the chorioid and the retina; examination showed the cornea, the anterior chamber and the iris to be normal. All tests showed that these transplanted eyes had vision. Such grafted eyes enlarged with the growth of the animals.

Histologic examination of the grafted eyes showed that in the majority of the retinae the cellular layers were recognizable. The optic nerves were regenerated even beyond the chiasma.

Pupillary Stasis Treated by Incision of Sheath of Optic Nerve. This treatment was advised by Wecher about fifty years ago but was not generally accepted. Muller revived it in 1916. The operation consists in making a temporary resection of the external orbital wall, to draw out the external rectus muscle by a thread, find the optic nerve, and to resect a triangular strip from its sheath about 3 mm. wide and 8 mm. long.

Kubik[10] reports that this operation has been done eleven times in Elsching's clinic at Prague. The pupillary stases has disappeared in almost all cases but the visual result and the definite end-results have not been encouraging. This may be explained by the fact that the stasis was due to cerebral tumors.

The operation, according to the author, appears to be one which should be absolutely discouraged in cases of cerebral tumors of precise localization, a radical opera-

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(9) Wien med. Wochenschr., Aug. 13, 1921.
(10) Klin. Monats. f. Augenhlk., June, 1921.

tion being preferable in all such cases. In other cases trepanation is advisable. If trepanation and decompression have been tried without affecting the vision, a resection of the optic nerve sheath may perhaps be justified.

Fat Grafts in Enucleation Cavities. O. Steiner[1] reports that in 422 enucleations done during the war a fat graft was implanted in 216. A similar implantation of fat was made in 242 exenterations. In the first series, 112 of the grafts "took" (89 per cent.); and fifty-seven of the grafts in the exenteration cases took (83 per cent.). In all cases in which the grafts failed the eyes were chronically inflamed. The taking of the graft is easier after enucleation than after exenteration; this is because the sclerotica offers better concealment to virulent microbes than the loose tissues of Tenon's capsule and because the nutrition of the stump is poorer through the fibrous shell of the sclerotica.

A number of patients thus operated upon have been under observation for several years and in about one-half retraction of the stump was seen. When such retraction was marked it has been possible to re-establish the primary condition by paraffin injections.

Implantation of fat (taken from the buttock or abdominal region) ought be the rule in all young patients as it prevents sinking of the orbit. It is contraindicated when there is infection either in the bulb or in the orbit.

Operations on the Lachrymal Sac. A statistical review of 70 Toti operations is given by J. Ohm[2], the youngest patient being 7 years old and the oldest 62. The operation lasts from 35 minutes to 1½ hours. The ocular wound must be dressed every day; the nasal tampon is renewed only every two days unless there is a febrile reaction. The patient is obliged to remain in hospital for from twelve to thirty-four days. Recovery is generally without any serious incident despite the

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(1) Klin. Monats. f. Augenhlk., August-September, 1921.
(2) Zeitschr. f. Augenhlk., 1921, vol. 46, p. 37.

inevitable infection of the operative wound. Some severe infection was observed seven times, phlegmon four times, erysipelas twice.

With regard to the final results: In all of the seventy patients operated on by the author, suppuration was reproduced only three times from a few weeks up to three months after operation, equal to 5.7 per cent. immediate failures. Thirty-eight cases have been followed for some years. Of this number suppuration was reproduced in seven although in general the communication with the nasal fossae was preserved. In 81.6 per cent. of the cases the result remained excellent which makes the Toti operation one that apart from the removal of the sac is otherwise meritorious. The removal of the sac still remains a mutilation which should be avoided if possible. As regards preference between the operations of Toti and West the author frankly recommends the Toti operation; the scar left by it is temporary and is not disfiguring. The incision is about 2 to 2.5 cms. long commencing a little above the palpebral ligament and following the internal angle of the nasal wall.

[In 1904 Cirincione devised a method by which he isolated the sac with the canaliculi but preserved them carefully *in situ,* bored an aperture through the nasal process of the superior maxilla just anterior to the lachrymal ridge, made sure of its freedom of communication with the nose and into the bony canal thus constructed he pushed the lower portion of the sac. In this way he was able to form and retain a perfectly sufficient drainage route for the lachrymal apparatus. He regards this plan of utilizing the mucous membrane of the sac as a lining for the canal artificially excavated through the bone, as an element in which his method excels that of Toti.—C. A. W.]

Epiphora After Extirpation of Lachrymal Sac. Epiphora is the most common sign and the most distressing symptom of infections of the lachrymal sac.

Hence, its persistence following extirpation of the lachrymal sac is disconcerting. This operation has been the one of choice in removing a hazardous infection, so far as vision was concerned. Investigation proves that in a majority of cases, so treated, epiphora persists and continues to be a troublesome factor.

Ophthalmologists, who are firm adherents of this operation, have contended that on removal of the purulent focus, little or no epiphora remained, since the reflex cause of stimulation of tears had been removed, or that there was a rapid decrease in the amount of epiphora as a result of an atrophy of the lachrymal gland, which followed the removal of the sac *in toto*, etc.

To get some data on the persistence of the epiphora after cystectomy, J. J. Gilbert[3] selected for study forty-five patients who presented no operative, or postoperative complications, such as fistula, or any form of suppuration, leaving as a basis of this report clean, healed examples of complete removal of the sac. The cases included patients operated upon for mucocele and stenosis following the abscess forms.

In this group of forty-five cases there was not one patient free from epiphora one year and a half after cystectomy.

In about 50 per cent. of cases the epiphora persisted for from two to five years.

In the majority of cases the epiphora was severe and was made worse by the wind, cold and prolonged use of the eyes.

In most cases the patients denied relief from the tears and were willing to undergo further surgery for relief.

These results indicate that the operation of cystectomy, while of great value in removing a source of infection, leaves a troublesome epiphora in most cases.

Aspiratory Puncture of the Vitreous and Ocular Decompression. The curative action of puncture of the vitreous in internal affections of the eye is treated

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(3) Laryngoscope, December, 1921.

by Zur Needen.[4] In two cases of post-traumatic opacities the visual acuity greatly augmented after six and two punctures of the vitreous respectively. In two cases of infection by a perforating wound, immediate daily (or every two days) punctures with aspiration of 0.4 to 0.6 cm. of vitreous gave excellent results. The treatment must be instituted while the infection is localized; sixty-five punctures in twenty-one cases never caused hemorrhage nor detachment and only a few chorio-retinal punctures were followed by a slight reaction. Regeneration of the vitreous is very rapid. The puncture is made at 5 or 6 mm. from the limbus the conjunctiva being slightly displaced by a fixation forceps. As much as 1 c.c. of the vitreous can be aspirated by a syringe. The treatment may be ambulatory at intervals of at least three weeks.

Junés[5] in cases of acute and simple glaucoma and in a case of cataract with hypertony of the eye made a prior aspiratory puncture of the vitreous through the sclerotica using a Pravaz syringe. About 0.25 to 0.33 c.c. is extracted and the operation can be repeated as necessary. The idea is to reduce the tension to normal. In cataract the author thinks this preliminary to operation is indispensable to prevent the operative complications which hypertonus provokes.

Blatt[6] has also tested the effects of puncture of the vitreous, but especially as a therapeutic measure. He finds that, based on experiments made on animals, from 0.6 to 0.8 c.c. can be aspirated from the vitreous body of human patients every eight days but that an extraction of 1 c.c. is not to be recommended. Three of the cases treated were chorioretinitis, the fourth was a traumatism of the eye with hypertension the anterior chamber being filled with blood. In two of the first three cases there was amelioration; in the other two cases the results were negative. The effect of the aspiration is prob-

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(4) Klin. Monats. f. Augenhlk., April, 1921.
(5) Clin. Ophthal., February, 1922.
(6) Klin. Monats. f. Augenhlk., June, 1921.

ably that hypotension of the globe brings about a hyperemia of the retinal and chorioideal vessels and that immunizing bodies arise from these vessels against bacteria and their toxins.

Rosenstein[7] has employed puncture of the vitreous in twelve cases of opacities, hemorrhages, myopia, etc. Cases without opacities of the vitreous have reacted very well. There is probably some ameliorative action of the circulation in the retina and chorioid. He has never seen detachment of the retina, but there was once a recrudescence of hemorrhages. The refraction constantly changes as the evacuations proceed. The quantity of aqueous humor removed at each sitting was 0.5 c.m. The punctures were spaced four weeks apart. Rosenstein thinks that vitreous puncture enriches ocular therapeutics.

NEW INSTRUMENTS

Improved Chalazion Forceps. The advantages of this revised instrument devised by S. W. Green[8] are many: It enables the operator to complete a chalazion operation more speedily and safely, and with no resulting postoperative trauma to the lids.

The locking device is regulated with three notches to enable the operator to regulate the tension on different lids and also to hold the instrument on the lid, especially if he wishes to pick up another instrument and an assistant is not present to hand it to him. It saves the task of eversions of the lid so many times, as was

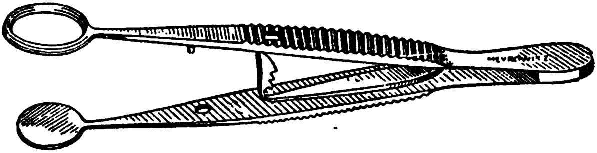

Fig. 16.—Improved chalazion forceps (Green).

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(7) Klin. Monats. f. Augenhlk., October, 1921.
(8) Jour. Amer. Med. Ass'n., July 1, 1922.

experienced with the older instruments when they slipped from the lessening of tension by the operator's fingers. It will also be noted that the ring is larger than the disk of the instrument. This has been made so as to avoid the strangulation of the lid tissues, which was too often a result from the older instruments because the operator may have handled his instrument a little too firmly to prevent it from slipping. For the same reason the surface of the ring that approximates the disc has been flattened (Fig. 16).

An Operating Hand-Lamp for Ophthalmic Work. For several months, in all operations on the eye, Ramsay[9] has been using with satisfaction a hand-lamp in which the source of illumination is the "pointolite" electric lamp of the Edison Co. The lamp is of 30 candle-power and is enclosed in a metal case with an aperture on one side in which a system of achromatic lenses is so fixed that the emergent rays are parallel. By this means the field of operation is evenly illuminated by a disc of light free from all shadows. A resistance is supplied with each lamp, whereby it can be used with a direct current from the main of any voltage between 100 and 250, and a special lamp can be obtained to work on any direct current down to 32 volts. Up to the present, however, a lamp has not been constructed for an alterating current. A convex auxiliary lens (a) of 3 diopters can be adjusted

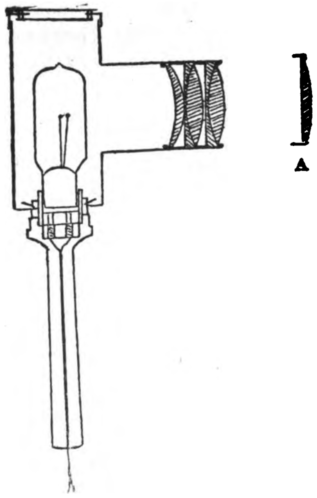

Fig. 17.—Operating hand lamp (Ramsay).

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(9) Lancet, Dec. 17, 1921.

in front of the fixed lens in order to bring the light to a focus. An opaque capsule after cataract extraction, no matter how thin it may be, is thereby brought so clearly into view that capsulotomy operations can be performed with great precision. The lamp can be used for a considerable length of time without any inconvenience from heating (Fig. 17).

"Anactine" Spectacles for the Protection of Sight. A. Bourgeois[10] reports a new kind of glass which he calls "anactine" glass for the protection of the vision against the effects of ultra-violet rays of the spectrum. This material is an extra white glass, but its power of absorbing the ultra-violet rays is due to the addition to its composition of the oxides of titanium, cerium and didymium in carefully determined proportions. It has a refractive index of 1523. It allows 99 per cent. of light rays to pass; it eliminates 40 per cent. of heat rays and arrests ultra-violet radiations as well as Monpillard's esculine glasses. Non-tinted glass is generally employed for spectacles, but a slight smoked tint is permissible for particularly sensitive eyes, especially for outside work. Bourgeois claims that the use of this new glass will guarantee protection from eyestrain and fatigue.

An Effective Dark Room. The accompanying illustration (Plate XXIII) shows an easily constructed dark room, as designed by S. L. Olsho.[1] The roof is composed of bristol board painted dead black. The shades are heavy, opaque, black cambric on steel rollers.

The room should be at least 5 by 6 feet. If it is placed favorably, history taking, ophthalmology, retinoscopy, refraction and transillumination can be done without moving the patient. One's office space seems not to be diminished. Disturbing side and rear reflections are under control. Darkness is restricted to the treatment area.

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[10] Clin. Ophtal., October, 1921.
[1] Jour. Amer. Med. Ass'n., Oct. 8, 1921.

If necessary, three or all four walls may be roller shades. The structure may readily be adapted for otolaryngology.

Hydrostatic Eye Douche. Thorough irrigation of the retrotarsal fold of the upper eyelid is one of the important essentials in cataract or any other operation requiring a corneal incision. With the nozzle of this irrigator one can easily flush the whole of the conjunctival cul-de-sac and the globe. After the flat nozzle has been inserted under the upper lid it can be raised; this action stretches the eyelid and takes out all the minute folds of the conjunctiva, allowing the fluid to wash away any lurking enemy that may have found lodgment, a future focus of infection.

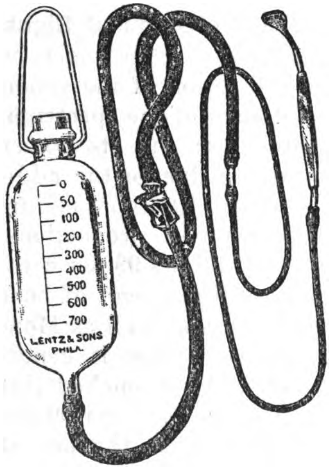

Fig. 18.—**Hydrostatic eye douche (Fox).**

The irrigator described by L. W. Fox[2] (Fig. 18) is made of sterling silver, gold plated, as he has found these metals better suited for the various mercuric chloride solutions in use. Gold-plating is employed because various experiments have proved that pathogenic germs will not grow on gold leaf.

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(2) Jour. Amer. Med. Ass'n., Jan. 28, 1922.

OCULAR THERAPEUTICS.

The Value of Drugs in Ophthalmology. In discussing the use of drugs in the treatment of affections of the eyes, the great assistance of heat, cold, electricity, massage, Roentgen ray, radium, organ therapy, the serums, surgery and, occasionally, even bleeding, must be borne in mind. The following is a brief synopsis of our knowledge of drug therapy, as outlined by W. H. Wilmer.[3]

Drugs Administered Internally for Eye Affections: Salicylates: These are of proved value in certain inflammations of the uveal tract, especially in sympathetic ophthalmia. They lessen pain, promote rest and sleep, and directly affect the local inflammatory process.

Sodium salicylate is the best of these representatives of the virtues of salicylic acid. In sympathetic opthalmia, best results have been obtained by very large doses.

Acetylsalicylic acid ("aspirin") is less disturbing to the digestion, and at the same time it is more prompt in its analgesic effect. In inflammatory conditions and discomfort following eye operations, 10 grains of acetylsalicylic acid given at bedtime will often assure a good night's rest and help to hasten recovery. This means a great deal when restlessness or anxiety is a real handicap to convalescence.

Iodides: Potassium iodide and sodium iodide were the sheet anchors of our ophthalmologic fathers. While they do not destroy the spirochetes in syphilitic conditions, they do cause the formation of a proteolytic ferment that has a distinctly selective action on the cellular elements of new tissue growths, or on inflammatory exudates. They therefore deserve to hold their place in present day therapeutics in both syphilitic and non-syphilitic eye affections. In interstitial keratitis associated with congenital syphilis, the iodides have proved themselves of real value. This is also true in

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(3) Jour. Amer. Med. Ass'n., Oct. 15, 1921.

extensive chorioidal lesions with vitreous opacities, irrespective of the cause.

Bromides: The bromides of sodium or potassium assist ophthalmic surgery by their sedative action on the nervous system, the depressing effect on the motor area of the cortex, and by allaying reflex excitability. In nervous people with poor control, the use before an operation of bromide in addition to the application of local anesthetics will prevent the danger of "squeezing," and will assist the patient in maintaining the necessary quiet after the operation.

Nitrites: The action of sodium nitrite is similar to that of the other members of the nitrite group in producing vasodilatation and reducing blood-pressure. It is useful in retinal hemorrhages in older people when there is high blood-pressure.

Amyl nitrite by inhalation is helpful in making a diagnosis in cases of toxic amblyopia. It also has a therapeutic value in the later stages of those cases in which there is a paleness of the temporal portion of the nerve.

Nitroglycerine has been used in cases of embolism of the central retinal artery.

Calcium Salts: Calcium lactate seems to possess a definite value when given in the dose of 5 grains three times a day for several days preceding an operation on the iris or muscles whenever the patient's coagulation time is markedly slow. In those cases in which there are recurrent hemorrhages of the retina, it is a valuable addition to the other appropriate remedies.

Barbital ("veronal"): This is usually very effective in producing sleep after operation, but sometimes produces great excitment instead. To use a patient's expression, "It set me nearly crazy." Its use, therefore, in ophthalmic surgery is not without some danger.

Cathartics: Properly employed, these are of much value in ophthalmic practice. Of these, cascara sagrada is especially valuable on account of its effect on the colon.

Cinchophen ("atophan"): This possesses the power of hastening the elimination of uric acid and the urates. In cases of increased blood-uric acid and a general so-called gouty tendency, cinchophen administered in 5 grain doses three times a day, before an intra-ocular operation, tends to diminish the danger of a postoperative iritis or iridocyclitis. It is very effective if given later in these cases when these conditions actually arise after an operation.

In hysterical patients, when the hysterical condition is complicating recovery, asafetida or valerian will have a quieting and, therefore, beneficial effect. The author is not prepared to say whether the effect produced is carminative, or whether it is purely mental from the evil odor and taste.

Hydrochloric Acid, Dilute: This is valuable when there are vitreous opacities without any visible fundus lesion, and which seem to be connected with a gastro-intestinal toxemia. Its stimulating effect on the stomach secretions, and its antiseptic effect on the intestinal tract, have been frequently mentioned.

Strychnine: The salts of strychnine can be used to advantage in cases of paresis of ocular muscles (including that of accommodation after diphtheria). They are also useful in cases of partial optic atrophy, in the later stages of toxic amblyopia, and in weakness of accommodation and convergence in neurasthenic conditions. It is well to remember the cumulative effect pointed out by Hare and others. It is best given hypodermically, and has to be pushed until toxic effects are shown in order to get the best results.

[In cases in which it is desirable to get the combined effect of systemic as well as local treatment, we have a colloidal preparation of arsenic, mercury and copper, under the trade name of Armervenol, which has a marked alterative action. For the past two years it has been used by many observers, who report very satisfying results, especially when combined with strychnine.—C. P. S.]

Hexamethylenamine: This product of ammonia and formaldehyde is often useful to the ophthalmic patient after operations whenever bladder complications cause much trouble and restlessness from constant desire to pass the urine.

Opium: Morphine sulphate has an analgesic, relaxing and depressing effect on the whole central nervous system. It is very valuable before operations on very nervous and pain-sensitive persons. It relieves the dread and the nervous shock of the operation, enables the patient to hold still without "squeezing," and enhances the effect of the local anesthetic. Before cataract extractions, it can be given in combination with atropine; in glaucoma, in conjunction with strychnine. It should, however, never be given before an operation unless the effects on that individual patient have been ascertained beforehand, because in some people morphine causes great cerebral excitement, nausea and vomiting.

Codeine is not so subject to individual idiosyncrasies as morphine, so that it can often be substituted with advantage for morphine. It is an effective reducer of pain, a good hypnotic and sedative. It is very useful in reducing cough or pain in operative cases.

Arsenic: Liquor potassii arsenitis (Fowler's solution) is very useful in some cases of clonic blepharospasm and also in later stages of malarial keratitis.

Arsphenamine: Given intravenously, this has proved of great value in all stages of syphilitic eye lesions. Just as in cases of syphilitic manifestations in other parts of the body, so in the later phases of the disease in the eye, it is well to associate arsphenamine with mercurials.

Neo-arsphenamine has not shown any great advantage over the first named arsenic preparation.

Mercurials: In spite of the introduction of arsphenamine and other arsenic preparations, mercury still has a place in modern ophthalmologic therapeutics. In addition to its general effects, it is very valuable in all inflammatory eye conditions, in unloading the intestinal tract of toxic material. Even people who are much annoyed by "muscae" affirm that the specks are much less troublesome "after a good cleaning out with calomel." In syphilitic conditions, the internal, the intramuscular injection, and the epidermal administration of mercurial preparations are very valuable. In ocular manifestations of congenital syphilis in children, it is of great value given as suggested by Fordyce and Rosen. The administration of mercuric chloride in conjunction with injections of neo-arsphenamine has been very effective.

Local Anesthetics or Analgesics: One of the great epochs in ophthalmology opened in 1884 when Karl Koller discovered the anesthetic properties of cocaine, for it was through his powers of observation that this precious boon was given to suffering humanity. Surgeons and patients the world over should rise up to call his name blessed.

Cocaine hydrochloride, owing to its free solubility, has been the form in which cocaine has been generally used. This salt—the oldest of the family of local anesthetics—though supplanted by many synthetic products, under some conditions, still has a niche which it fills effectively. In addition to holocaine for ocular operations, with atropine in certain severe inflammations of the uveal tract, and with miotics in painful cases of absolute glaucoma, cocaine has no rival. But on account of its instability, toxicity, dilating effect on the pupils, drying effect on the corneal epithelium, and its danger of causing glaucoma, it is best supplanted in certain cases by some of the newer products of synthetic chemistry.

The principal synthetic products are beta-eucaine, holocaine hydrochloride, stovaine, alypin and procaine.

Holocaine is used chiefly because of its antiseptic properties, absence of effect on the pupils and corneal epithelium, and lesser toxicity. For use in office work for removal of foreign bodies on the cornea, etc., its advantages are obvious. Its sterilizing and stimulating effect on corneal ulcers makes it doubly valuable.

The subconjunctival injection of a 0.5 per cent. solution of procaine with epinephrine in addition to the local instillation has been very efficacious in intraocular operations. Generally the injections are given below; but in sclerocorneal trephining, in muscle operations, and in some cases of iridectomy, the injections are made at the site of the operation. Even in cases of glaucoma, epinephrine is added to the procaine. In glaucoma cases that are suitable, a hypodermic of morphine with strychnine is also given twenty minutes before the operation.

Ethylmorphine hydrochloride ("dionin") acts as an analgesic and as a local vasodilator. In corneal scars, uveal exudates and vitreous opacities it seems to assist nature in bringing about absorption. It is well to remember the varying individual sensitiveness to this drug. Some persons stand an initial strength of 1 per cent., while others experience great discomfort from one-fifth that strength. The patient should be informed beforehand of the local effects it is likely to produce, especially the reflex sneezing.

[For the past year, Butyn has been largely used by the ophthalmic profession in preference to cocaine. Its manufacturers submitted the claims made for it to the Council on Pharmacy and Chemistry of the American Medical Association, who found it to be a synthetic product having the constitution and properties claimed. Its value has been proved by careful investigation. It is the most important rival to cocaine that has yet appeared. Its practical advantages, as given by the committee on local anesthetics, are as follows: (1) It is more powerful than cocaine; (2) its action is more prolonged than that of cocaine; (3) it acts more rapidly than cocaine; (4) it is aparently less toxic than cocaine; (5) it produces no drying effect on tissues; (6) it does not alter the size of the pupil; (7) it has no ischemic effect and therefore causes no shrinking of tissues; (8) solutions can be boiled without imparing their anesthetic efficiency. An added advantage is that it can be procured without a federal narcotic blank. Butyn may be used with epinephrine but not with sodium or other chlorides.—C. P. S.]

Cycloplegics and Mydriatics. Atropine is the historical progenitor of this group of drugs. Murray quotes Fukala as stating that belladonna was first introduced between 500 B. C. and 130 A. D. Owing to Galen's disfavor, its use was abandoned for many centuries.

The great value of atropine sulphate in ophthalmic therapeutics is too well recognized to require mention. Without it (or some of its substitutes) the present day ophthalmologists would indeed be lost. However, it is a potent drug and should at all times be used with care. In all elderly people, or in young people with a glaucomatous tendency, its use should be confined to those cases in which no substitute would answer the purpose. In all cases in which cycloplegics are used for purposes of refraction or ophthalmoscopic examination, a 1 per cent. solution of piocarpine should follow the completion of the test. Children are especially sensitive to atropine, and there are few of us who have not seen the flushed face, dry mouth, bright eyes, rapid pulse and respiration, and great excitability following its use.

When the patient exhibits an idiosyncrasy for atropine, scopolamine hydrobromide is the best substitute. This is especially true in operative cases for glaucoma, and in those cases in elderly people in whom atropine has an exciting action. It has less tendency to cause local irritation, or to increase tension, and acts as a cerebral sedative. However, it must not be used in strong solution, for some people are easily affected by it.

For the ordinary case of ophthalmoscopic examination, euphthalmine (which is now being manufactured under the name of "eucatropin") is the drug *par excellence.* Its use also is made more satisfactory by the addition of a very minute amount of cocaine. One instillation in persons over 50 years of age usually gives marked mydriasis in from thirty to thirty-five minutes. In very elderly people, the instillation of a 4 per cent. solution of cocaine repeated at the end of ten minutes usually gives a satisfactory dilatation of the pupils at the end of fifteen minutes from the first instillation. It is most important in all cases in which cocaine is used to keep the eyes closed as much as possible until the examination is made in order to prevent the irregularity of the corneal epithelium. Some observers have reported satisfactory results from the use of duboisin and daturin.

Local Antiseptics and Astringents: The ophthalmologist as well as the patient must regard boric acid with a sense of eternal gratitude. Though it has been in use for more than 200 years, it still holds the place of regard. It is most widely used as a household remedy, a standby in ophthalmic practice, and a constituent of nearly all proprietary collyria. Its safety and its soothing qualities warrant the continuation of its use.

Mercuric chloride has long stood at the head of the list of antiseptics in ophthalmic practice. It is of great value in irrigating the conjunctival cul-de-sac in a 1 : 5,000 or 1 : 10,000 solution before the operations. In the shape of a salve of 1 : 5,000, it can be used in the bandaged eye the night before an operation and for filling the eye after an operation. In cases of corneal ulcers, the salve is very efficacious when used in the eye every two hours, in addition to the other treatment. In a few cases, when an idiosyncrasy exists, it causes conjunctival irritation, chemosis and dermatitis. The patient should be tested before the operation for the possibility of such an idiosyncrasy.

Some operators of great experience prefer mercuric oxycyanide.

Chlorine water is one of the most satisfying of all antiseptics in the treatment of certain types of blepharitis, especially blepharitis squamosa. The official chlorine water is used in the strength of one dram to half a pint of tepid water, and the lid margins are thoroughly washed twice a day with absorbent cotton.

Solution of formaldehyde is very valuable in the treatment of corneal ulcers. It may be used by direct application to the anesthetized ulcer in the strength of 1 : 50, on a cotton-tipped probe, or it may be used as an irrigant in from 1 : 1,000 to a 1 : 5,000 solution.

Iodine is very efficacious in the treatment of corneal ulcers. A 2 per cent. solution applied to the lid margins is a remedy that has no superior in nearly all cases of blepharitis. Of course, it is essential that all crusts should be removed first.

Yellow mercuric oxide with good reason is a favorite remedy in all inflammation of the lid margins. However, in some cases it acts as a marked irritant, causing a toxic dermatitis. In these cases, ichthyol as a salve is a good substitute, as the most sensitive skins do not seem to resent its presence.

Resorcin, too, alone or in combination with other drugs such as oxide of zinc ointment, is very efficacious.

Among the newer remedies, ethylhydrocuprein hydrochloride ("optochin"), a quinine derivative, is particularly effective in any pneumococcus affection of the eye or eyelids. It is very valuable in serpiginous ulcers, in all forms of purulent conjunctivitis, and in blepharitis.

A still more recent antiseptic is mercurochrome, which is a combination of fluorescein and mercury. It is very highly thought of by Dr. Lancaster and his colleagues on account of its germicidal, non-irritating, yet penetrating qualities. Dr. Lancaster advises its use before operations, and also in acute infections of the ocular and palpebral conjunctiva. It may be used in strength from 1 to 2 per cent. solution.

Pyoktanin (one of the anilin dyes) has been much lauded as a remedy for various eye infections, but it does not seem to possess as satisfactory antiseptic properties as some of those already mentioned.

Silver nitrate has long been recognized for its valuable antiseptic and astringent effects in diseases of the conjunctiva. Its effectiveness in gonorrheal conjunctivitis in the adult and in the new-born can not be denied. Its application, however, is painful. As a preventive measure in the new-born its use is not without danger when in a 2 per cent. solution it is dropped on the delicate cornea. Owing to the irritating effect of silver nitrate, many substitutes have been found in the silver protein compounds. Among the many, argyrol has proved of great value from its germicidal, cleansing, yet non-irritating qualities. In spite of early laboratory tests showing the inertness of argyrol as a bactericide, ophthalmologists of the greatest clinical experience have continued to report satisfactory results from its use in a multitude of different cases. Later laboratory tests have corroborated the clinical findings of its effectiveness. Before and after eye operations, in all chronic and acute purulent affections of the conjunctiva, it is of great value. The solution, however, should always be fresh.

While protargol is of great germicidal value, it is much more irritating than argyrol.

Copper sulphate in the shape of the copper stick is indicated in trachoma.

Zinc sulphate or chloride, a valuable astringent in all inflammations of the conjunctiva, possesses specific bactericidal effects in cases of diplobacillary conjunctivitis.

Alum, in the shape of the stick, is a good astringent for applying to limited portions of the inflamed conjunctiva.

Among the vegetable astringents, tannic acid is valuable as an ingredient for collyria for home use as well as for application in the office.

Miotics. Of the different salts of physostigmine, the salicylate is one of the most satisfactory. Physostigmine is a very efficient contractor of the pupils and a stimulator of the ciliary muscle. It is therefore very valuable in the medical treatment of glaucoma. However, it is a drug that should be used with precaution, and the solution should not be stronger than is necessary for obtaining the result desired. A strong solution for hastening the disappearance of medicinal mydriasis is often very uncomfortable and disturbing. In long continued use of even weak solutions it may after awhile become a marked irritant, the conjunctiva showing a condition not unlike the conjunctivitis from atropine. In some cases its effect is less severe, the patient complaining merely of irritation after its use, and the eye exhibiting a hyperemia of the ocular conjunctiva with a mild circumcorneal injection.

Pilocarpine hydrochloride is milder and less irritating than physostigmine. It is often happily combined with a small amount of physostigmine salicylate. In all collyria containing miotics, boric acid is also added.

Subconjunctival Injections. The eye lends itself well to subconjunctival injections owing to the ease with which they can be employed, readiness of absorption, and facility for noting the effects. In properly selected cases, with the majority of drugs used the injection is painless.

Ophthalmic surgeons have used, subconjunctivally, a great variety of drugs in many types of ocular lesions. Darier especially has had great experience in ocular therapeutics of this nature. It is well to remember Darier's expressed contraindications to the use of subconjunctival injections "when there is present circulatory stasis, rendering absorption of medicaments difficult or impossible by the obstructed lymphatics. Under such circumstances, mercuric cyanide injected beneath the conjunctiva will act as an irritant more harmful than useful, and producing intense pain and chemosis.'' Patients, too, complain bitterly of the pain following its use in uveal inflammations, detached retina, etc.

When the specific action of a drug is not called for, but when it is desirable to promote absorption of extravasated blood, inflammatory exudations, or the fluid under a detached retina, physiologic sodium chloride solution acts admirably in the latter stages after acute conditions have passed away. It is painless, causes very little reaction, and it can be repeated as often as every other day. It is especially effective if associated with other remedies, including rest in bed.

Alcohol in Blepharospasm. Essential blepharospasm resists almost every kind of treatment. Van Lint[4] says that only one method has a sure action against it, *viz.*: injection of alcohol in the facial nerve at the styloid apophysis. The alcohol injection is preceded by an injection of novocaine. The needle is inserted about a centimeter outside the interestction of a horizontal line passing through the inferior border of the orbit and a vertical line which follows the external orbital edge. The alcohol injection (about 2.5 c.c.) is made into the region about ten minutes after the injection of the novocaine. Van Lint finds the results entirely satisfactory.

Sub-Conjunctival Injections. Vialleton[6] has had excellent results from the following antiseptic preparation for subconjunctival injections in threatened or established infections:

Methylene blue, 0.20 gr.; saccharose, 5 gr.; distilled water, 100 gr.

By the addition of the saccharose to the methylene blue an analgesic effect is produced which enables patients to tolerate the injections.

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(4) Archiv. d'Ophtal., October, 1921.
(6) Clin. Ophtal., October, 1921.

A New Bactericidal Agent for Use in the Conjunctival Sac. For the past year H. Gradle[7] has been experimenting with a new bactericidal agent called neo-silvol. It is a colloidal compound of silver iodide with a soluble gelatin base, the latter preventing coagulation and precipitation of the finely divided silver iodide which is in suspension and not in solution. It is soluble (if colloidal suspension may be called solution) up to 30 per cent., forming a milky-white slightly viscid liquid. This does not turn dark on exposure to air and light and does not stain the skin or linen. However, there is the disadvantage that the solution undergoes a change within a week and must be freshly prepared at least every seven days. In 10 per cent. solution it is not irritating to the conjunctiva. The laboratory reports show that the phenol coefficient is about "5" by the Rideal-Walker method when tested on *Bacillus typhosus,* indicating that the germicidal power of neo-silvol is five times that of an equal solution of phenol from a purely experimental standpoint.

Clinically, neo-silvol in 10 per cent. solution has proved useful in certain definite types of cases. It was used in thirty-seven cases of acute purulent conjunctivitis with mixed bacterial flora with very satisfactory results. Seven cases of blepharo-conjunctivitis yielded with a fair degree of rapidity to the compound. In three cases of hordeolum, no appreciable results were found and the use of the drug did not prevent a recurrence of the condition. Three corneal ulcers of low degree were treated with neo-silvol, but it could not be seen that the results were superior or more rapidly attained than by other methods. It was used in two cases of purulent dacryocystitis, but without noticeable effect.

From these few cases, which it is entirely unnecessary to detail, it would seem that neo-silvol is particularly useful in acute purulent inflammations of the con-

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(7) Illinois Med. Jour., March, 1922.

junctiva of mixed bacterial origin. The penetrating power of the drug does not seem to be greater than that of other colloidal silver salts and consequently but few results were obtained where deep penetration into the tissues was necessary. The desired effects seem to be heightened if the drug is used in the following manner: Instill one or two drops of 10 per cent. neo-silvol into the conjunctival sac and allow to remain for a minute or two; then flush from the conjunctival sac the muco-fibrinous secretion which has been loosened by the neo-silvol (allow the patient to use an eyecup with boric acid or salt solution or any mechanical flush); dry the eye by slight pressure with gauze or cotton, thus pressing out the excess of fluid from the conjunctival sac, and again instill one or two drops of neo-silvol. As the solution is somewhat viscid, the patients are apt to comment on the oily nature of the drops; but that is not an undesirable property.

In neo-silvol we possess a bactericidal agent for the conjunctiva that has the following advantages over the other colloidal silver salts:

1. It is non-irritating.
2. It is non-staining.
3. It is possibly somewhat more efficient in acute purulent inflammations of the conjunctiva.

The disadvantages may be enumerated as follows:

1. It is not very stable, requiring a fresh solution every seven days.
2. It is somewhat "sticky."
3. The power of penetration is only superficial.

["Lunosol" is a colloidal silver preparation recently brought out by Hille, who was the originator of argyrol. Laboratory investigations have demonstrated that Lunosol has greater germicidal power. In comparative tests with gonococci it is twenty times as powerful as four of the best known silver salts. It does not precipitate albumin; is not precipitated by the chlorides; has no caustic nor corrosive action and does not irritate even in strong solutions. Because of its non-staining property, it has this distinct advantage over this highly objectional feature of other silver salts.—C. P. S.]

Effects of Parenteral Injections of Milk in Eye Diseases. Bargy[8] has worked for several years in Tonquin, where, as in Egypt, China, etc., there is a great prevalence of ocular diseases, especially conjunctivitis, corneal lesions, and trachoma, the last-named being responsible for 72 per cent. of the prevalent blindness. Moreover, more than 98 per cent. of the patients coming to the author's eye hospital showed evidence of extinct or active trachoma. In this hospital, at Hanoi, more than 4,000 patients have been treated during the past two and one-half years of whom about 2,400 were cases of conjunctivitis. Milk injections were an essential part of the daily therapeutics in these cases, being used on the same basis as copper sulphate, zinc sulphate, silver salts, etc.

Milk injection in eye diseases is not a panacea for all cases. There are even failures, though they are rare. It is well to remark that the classical treatment was not neglected, but used concurrently with the milk injections.

The first effect observed is the cessation of subjective troubles, especially pain, and photophobia. Then follows modification of the secretion. At the same time all the inflammatory phenomena, edema of the lids, conjunctival redness, chemosis, become attenuated after the first injection, and disappear in a few days. In iritis, the pupil, which is often refractory to atropine, dilates after the first or second milk injection. In corneal ulcer the ulcerative process is arrested, the ulcer becomes transparent; the injection has acted similarly to cauterization or curettage.

In infections the microscopic examinations become negative after a few days; the gonococcus, for instance, is not found after the sixth day.

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(8) Clin. Ophthal., February, 1922.

Milk injections have a prophylactic effect of the first importance. Such prophylactic effect has been utilized as a preliminary to surgical interventions with the object of reducing the chances of secondary infections. The author has found this prophylaxis of immense benefit in obtaining an aseptic condition prior to operations for cataract, etc.

All the foregoing effects of milk injections become manifest after the second injection and sometimes after the first.

The dose should never exceed 10 c.c. The author has on the average employed a dose of 5 c.c. for an adult of normal weight, the quantity of the dose varying above or below this according to the intensity of the reaction. For children the dose is from 1 to 3 c.c.; infants receive from 0.5 to 1 c.c. In the aged it is well to begin with a dose of 3 c.c.

The preferential site for injection is in the muscles of the thigh region. The milk is first boiled for ten minutes, and then for a few minutes more when making the injection. Care must be taken to avoid a vein. In his past two years' practice the author has observed local suppuration from the injection only twice.

Subconjunctival injections do not appear to have any particular advantage. If the reaction following the first injection is nil, the quantity of injection should be doubled; the injections should be made every day or every alternate day; but it is generally useless to exceed eight injections in fifteen days.

Reaction appears from the second to the sixth hour following injection; some fever with perhaps cephalia, malaise, languor, insomnia, etc. Rarely there may be a fall in arterial pressure, congestion of the face with cyanosis of the lips, slight dyspnea and a tendency to syncope.

While milk injections can not be considered as a panacea in the different diseases of the anterior segment of the eye, yet Bargy believes that it is an extremely valuable aid in suppressing suppuration menacing the cornea, and the method is distinctly prophylactic in conjunctivitis. It is a mode of medication which is simple and an anodyne which is always well to try in severe cases or when it is found that other treatments have given only doubtful or no effects. It is of no value in trachoma.

Milk Injections in Keratitis. Van Lint[9] in three cases of parenchymatous keratitis tried intramuscular milk injections associated with intravenous injections of neosalvarsan. Parenchymatous keratitis is scarcely influenced by ordinary antisyphilitic medicaments. When the milk injections (5 c.c.) are associated with neosalvarsan, although there is no disappearance of the ocular affection for some days, yet it is certainly influenced more favorably than by any other mode of treatment; and the combination of the two injections gives results which are clearly superior to those which are obtained from the employment of one or the other alone. The subjective ocular symptoms recede rapidly. There is a good effect on the general state. Although the results are on the whole far from complete, yet they are unquestionably a decided advance in the treatment of parenchymatous keratitis.

Objectionable Effects of Milk Injections. L. B. de Haan,[1] while admitting the good effects of milk injections, thinks that some proteinic substance other than milk should be selected on account of some of its effects, such as a rapid softening up of a corneal abscess and its perforation; abscess at point of injection. Focal reactions may also occur with tuberculosis, scrofula and typhoid. Heart and respiratory disturbances have also been observed as well as anaphylactic shock. With status lymphaticus and asthenia, milk injections are liable to cause more disturbance than otherwise. But on the other hand the greater the

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(9) Clin. Ophthal., April, 1922.
(1) Nederl. Tijdschr. v. Geneesk., Sept. 17, 1921.

reaction the more beneficial is the therapeutic effect as a general rule.

Reports of Milk Injections. L. V. Liebermann[2] is very enthusiastic concerning milk treatment of eye diseases. The method is still empirical as it is not really known how the milk acts; but this is no reason, he says, to refuse to acknowledge what prominent clinicians have testified. The action of milk in gonorrheal ophthalmia, he states, is incontestable. Chemosis is the most important marked effect of milk injections as it prevents corneal ulceration which is never produced except when there is marked chemosis. The author has observed striking effects from milk in lymphatic keratitis and heredo-syphilitic parenchymatous keratitis. All have admitted the action of milk on iritis. Purulent corneal ulcers and panophthalmias are rebellious to the milk treatment. Anaphylactic shock was observed only once by this author after three injections, the one being in a vein. Liebermann boils the milk and sterilizes it for thirty minutes. Lactic preparations have no advantages and expose to anaphylaxis.

Perez Bufill[3] has tried milk injections in twenty cases comprising hypopyon ulcers, deep corneal abscesses, iritis, retrobulbar neuritis, parenchymatous keratitis, orbital cellulitis, etc., and has become a warm advocate of this method of treatment. He thinks that sterilized milk is the most powerful of analgesics in all affections of the ocular globe, and that such injections give recoveries which are most difficult if not impossible to obtain with local antiseptics alone.

G. Tobias[4] says that in nonspecific proteinotherapy in eye affections the intensity of the ocular reactions renders the employment of the method dangerous. These reactions consists in an intense injection of the bulbar conjunctiva, infiltration of the cornea and sometimes the formation of a veritable hypopyon.

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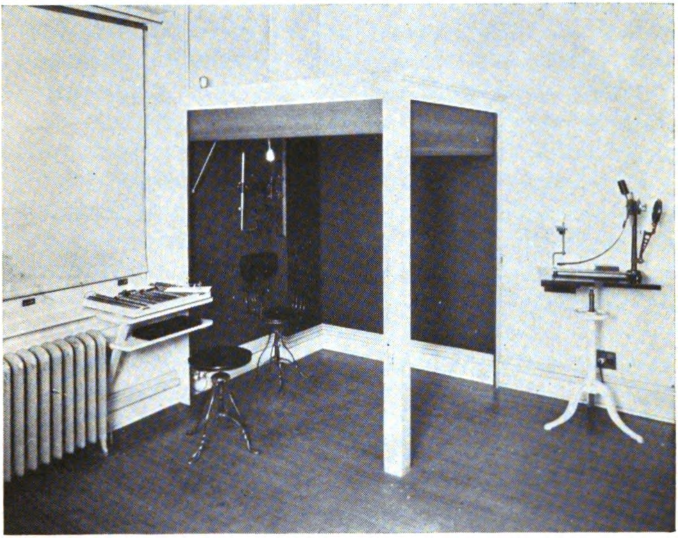
(2) Zeitschr. f. Augenhlk., October, 1921.
(3) Archiv. de Oftal., August, 1921.
(4) Klin. Wochenschr., March 11, 1922.

PLATE XXIII.



Easily constructed dark room.—Olsho, page 173.

A. Darier[5] thinks that milk injections, like those of typhoid vaccines, act by active aspecific immunization with an always marked febrile reaction, while the specific or para-specific sera act by passive immunization by bringing to the diseased organ defense elements and hormones elaborated by inoculated animals. This reactional treatment could not only not replace serotherapy but the two methods could only be very complementary, especially since it has been proved that sera absorbed by the buccal route are entirely incapable of causing anaphylactic phenomena while preserving a large part of their therapeutic value.

A. La Ferla[6] says that in 200 patients whom he treated by milk injections he sometimes obtained surprising cures especially in subacute plastic iritis of whatever origin. Attenuation of the subjective symptoms was observed even after the first injection. He also noticed good results in traumatic infections, in keratoconjunctivitis, in gonococcus ophthalmias, and in the corneal complications of trachoma.

Massage of the Eyeball. Massage has been employed in the treatment of diseases of the eye since the early '70s, but particularly during the past twenty years. Donders formally introduced eye massage to ophthalmologists at the London Congress in 1872. Pagenstecher has done more than anyone else to spread the knowledge of this therapeutic agent; he published his first report in 1878 and it aroused marked interest. In 1881 he compiled a report on the therapeutic value of massage in many diseases of the eye. Since that time Schenkl, of Austria; Panas, of France, and Gradenigo, of Italy, and many others have added valuable contributions to the subject.

V. Würdemann[7] describes a case of embolism of the central retinal artery in which deep digital massage was used with benefit. In cases of posterior synechiae

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(5) Clin. Ophtal., November, 1921.
(6) Archiv. di. ophtal., October, 1921.
(7) Northwest Med., December, 1921.

he has found that forcible massage of the eye with the suction pump breaks up these adhesions and results in a free pupil.

The diagrams here submitted (Fig. 19) show the directions of force applied to the eyeball by this procedure, which is recommended as being rational, without danger and successful in a goodly proportion of cases. Most of the authors employ digital massage in embolism of the central retinal artery, but we find that mechanical massage easily supplants and is, furthermore, an improvement over the digital method (except where very powerful action is desired, as in recent embolism of the central artery), first, on account of cleanliness, as the rubber massage cup can be sterilized; second, more uniform vibrations are obtained; and, third, it is less distasteful to the patient.

For the past year the author has employed a rubber cup massage handle which receives its power from the Victor transformer No. 2 and the Pynchon pump attachment. The nipple of the pump should be at a point two-thirds distant to the right, when we obtain vibrations or alternate compression and suction. The force or gentleness of the stroke is also regulated by thumb pressure over the hole in the handle. Great care should be exerted that neither the length nor the amount of the stroke causes any discomfort. In fact, the slower the stroke the better it is. The best results are obtained with from 50 to 150 vibrations a minute. With the transformer and pump attachmment the length of the stroke varies from 0 to 1¼ inches, and the length of the stroke desired can be selected by a gauge attached to the crank pin. The rapidity of the piston stroke varies from 30 to 600 vibrations a minute. Suction and release with as long a movement of the piston as possible, in order to pull the eye in and out of its socket as far as can be give the best results. The suction and release are used for about one-half minute, the eye looked at and, if no evidence of hemorrhages in the anterior chamber be found, used again for about a minute, the eye examined again and repeated for about one minute. On the next day the treatment may be given again if necessary, but in many cases the adhesions come away, leaving some of the pigment layer of the iris on the anterior capsule. The pupil becomes round and in an hour or so is found to be fully dilated under the influence of atropine.

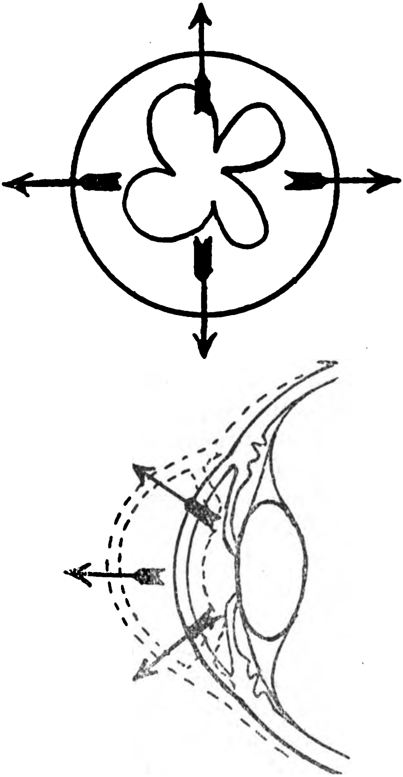

Fig. 19.—Diagram showing direction of force exerted by suction massage upon the iris and cornea (Wurdemann).

There have never been any evil results, even when hyphema has occurred. This treatment should be used with great caution where there is evidence of implication of the ciliary body and the chorioid, *i. e.,* when there is minus tension, for the fear of producing a detachment of the retina or chorioid, or intra-ocular hemorrhage. However, these accidents have never been observed by Würdemann even under the most strenuous treatment, such as have been given in digital and suction pump massage, as used for embolism of the central artery or in numerous cases of glaucoma and in optic nerve atrophy. The eyeball is quite resilient and, under the effects of external pressure, may be dented in or forced back into its socket and by suction pulled forward, the cornea drawn out and the shape of the globe temporarily changed. The cornea, being more elastic than the sclera, is more changed and pulled away from its base, thereby drawing the ciliary body and iris away from the lens, the lines of force being not only directly forward but to one side as well. Hence, if the iris be attached at any part of the lens, the force tends to tear it away and thus relieve the adhesion.

It is well known that glaucomic tension may be reduced by rubbing the eyeball. Instrumental massage is more radical and more effective.

Ophthalmoscopic observation of the effects of massage in the fundus of the eye, in cases of embolism, showed that a pronounced hyperemia of the optic disc and dilatation of both arteries and veins immediately followed the procedure. This led to the idea that the nutrition of the optic nerve and retina, in some cases of optic nerve atrophy, could be improved and so it is in selected cases, but they must be appropriate for this treatment.

Partial primary optic nerve atrophy, that atrophy consecutive to optic neuritis and chronic retinitis, can probably be checked, the nutrition brought back to the nerve, the discs made to look more normal, the visual acuity and the fields greatly enlarged and the patient preserved as a useful member of society in the greater majority of cases. But the diagnosis of primary atrophy or partial degeneration of the optic nerve fibers at the ocular end of the nerve must be assured before a favorable prognosis can be given. One surely can not theoretically expect any effect upon the visual tracts or centers from an oscillation of the eyeball, a stretching and vibration of the optic nerve, which can not possibly extend further than the apex of the orbit.

The same may be said of the local effects of electricity, for these are peripheral treatments.

Fourteen are the few cases reported by the author of optic nerve atrophy that have improved under treatment, and in these the improvement is ascribed mainly to the betterment of the nutrition of the retina and optic nerve by the electricity and massage. Improvement or cessation of the loss of vision can only be hoped for in partial primary atrophy or that following papillitis, and the diagnosis of these conditions must be assured before any results can be hoped for by such procedure. The treatment should be thorough and long-continued for at least one year. It must be given with proper apparatus by competent hands.

Occasion has not been afforded for treatment of retinitis pigmentosa by massage. But theoretically, as this disease is essentially a nutritional disease of the retina, with peripheral consecutive atrophy of the nerve, any increase in its nutrition may effect improvement of function and hence it is herewith recommended for trial to anyone who may have the opportunity.

The treatment of ocular diseases by means of electricity and massage has been sadly neglected by the regular practitioner and greatly abused by the charlatan. A warning must be given as to the indiscriminate use of massage of the eye. It has been in the hands of quacks and osteopaths and much damage has been done thereby. Electricity is only a placebo in the hands of empirics. Properly used it can be of incalculable benefit in many cases.

The Finsen Light Bath in Ophthalmology. In the Finsen Institute at Copenhagen, Lundsgaard[9] has submitted several patients with different eye conditions to light bath therapy. The results were not encouraging. Lundsgaard does not agree with authors who have reported the rapid disappearance of ocular tuberculous affections with this therapy.

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(9) Klin. Monats. f. Augenh., June, 1921.

One patient with phlyctenular keratitis received 188 light baths in the space of a year; another such patient 101 baths in six months and in both cases there was recurrence. It may perhaps be said that the transformation of phlyctenular into vascular keratitis is a little more rapid under treatment; it can not be said that light treatment cures phlyctenular keratitis.

Thirty-one cases of nodular ulcerous tuberculous keratitis were treated. There was no real cure from light baths.

In fifty-eight cases of tuberculosis of the lachrymal passages with lupus, more than an average of ten baths each was given. The only cases in which amelioration was observed were those in which there was a tuberculosis of the lachrymal sac, opened and curetted, which shows that purulent closed foci must be opened before light can be effective.

The therapeutic effects have been somewhat better in iritis and in chronic iridocyclitis. Recovery was obtained in five of ten cases. These cases gave a positive tuberculin but a negative Wassermann reaction.

Light was ineffective in a case of hemorrhage of the vitreous.

Generally the author thinks that light therapy should not be advised in ocular therapeutics. It may be of aid combined with other treatments, but as an isolated treatment it gives practically no results.

MISCELLANEOUS OPHTHALMOLOGIC ARTICLES

Monocular Exophthalmos. Monocular exophthalmos is a condition which on account of its invasion of one eye at once classifies it as not being exophthalmic goiter or Basedow's disease.

The exophthalmos may vary from a few millimeters to a condition in which the eye is literally forced from the orbit.

There are many causes which enter into monocular exophthalmos as an etiologic factor:

Tumors of the orbit, ethmoid or sphenoid, cause a slow growing exophthalmos which may be months or years developing. Abscess in the ethmoid, sphenoid, frontal sinus or antrum give rise to a much more rapid exophthalmos as a rule. Hemorrhage in the orbit is generally the result of traumatism. Paralysis of the ocular muscles or tenotomy of muscles can result in a slight exophthalmos. Thrombosis of the exophthalmic vein and brain tumor are causes of exophthalmos. Pulsating exophthalmos is due to changes in the blood-vessels in and around the orbit.

B. M. Howley[1] describes a number of clinical cases to illustrate this condition.

Xerophthalmia and Fat-Soluble A. Many investigators have attempted to discover the relationship between the fat-soluble A vitamine and xerophthalmia, as well as other features present in the disease which might be etiologic factors in producing this condition.

The results obtained have varied in the extreme; thus, Emmet claims to have produced xerophthalmia in 120 out of 122 rats on the fat-soluble A free diet, or 98 per cent. Osborne and Mendel produced the condition in sixty-nine out of 136 rats, or approximately 50 per cent. Stephenson and Clark were successful to the extent of 28 per cent., and question the condition as a

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(1) Jour. Med. Soc. of New Jersey, March, 1922.

true deficiency disease. There have been many other observers whose results lay in between those above, some of whom apparently felt that the main factor in the disease was not the lack of fat-soluble A. Bulley summarizes his work by stating that, with the avoidance of initial infection, experimental animals can be kept almost entirely free of this so-called deficiency disease whether fat-soluble A be present or absent, and that it is dangerous to draw conclusions as to the fat-soluble A content of any diet from the appearance of xerophthalmia.

Wason, in a study of the pathology of the condition, states that no fundamental data concerning the etiology of ophthalmia in rats on deficient diets have been found by anatomic studies. Evidence by many observers leads to the belief that the condition primarily can not be due to bacteria or to the degree of cachexia. Rats under the same hygienic conditions and on the same diet exhibit corneal changes, if at all, at varying intervals of time and degree; and in some cases considerable time elapses between the inception of the disease in the two eyes of an animal. She draws an analogy between the specificity of chloroform for liver cells, of mercury for the epithelium of the tubules of the kidney, of tetanus toxin for the nervous system, and of the absence of fat-soluble A to corneal lesions.

Along somewhat similar lines, except that the observations were on human beings, Black believes that xerophthalmia and dystrophy in young children are caused by deprivation of fat-soluble A, as is shown in Denmark, where margarine was substituted for butter. Wells has made similar observations in Roumania.

In a series of experiments with rats, S. Walker, Jr.,[2] concludes:

1. The lack of the fat-soluble A vitamine produces xerophthalmia in a variable percentage of experimental animals.

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(2) Jour. Amer. Med. Ass'n., Jan. 28, 1922.

2. Since this lack of vitamine in combination with a low grade infection does not induce the disease in all animals, there is obviously another factor, or factors, not yet worked out.

3. Hereditary predisposition might explain the widely variable and anomalous results obtained by workers in this field.

Some Relations of the Endocrine System to Ophthalmology. It is becoming increasingly apparent that endocrinology is a biologic conception which is fundamental and essential to our understanding of vital reactions in health and disease. This alone, as pointed out by P. Fridenberg,[3] makes it incumbent on ophthalmologists to familiarize themselves with the data already obtained and to apply them intelligently to the recognition, and eventually to the treatment and prevention of ocular disturbances. Recognizing a certain endocrine predominance in definite categories, we shall, as thinking physicians, put a different and an added interpretation on sex, age, race, environment, climate and diet. The term constitutional, applied to disease or to treatment, must include the study of the glands of internal secretion. Such varied factors as specific disease, tuberculosis, rheumatism, focal infections, the lymphatic diathesis formerly labeled scrofula, are not only potent in producing the histologic changes recognized so early by the cellular pathologists of Virchow's era; they also profoundly affect the internal secretions and the glands which supply them and so bring about prepathologic or ante-organic changes which those who know can recognize beyond a doubt. Syphilis appears to have an almost selective action (destructive) on the glands presiding over immunity, pigmentation and development of epithelial structures; and the clinical forms of attenuated specific disease, of parasyphilis, or of *lues hereditaria tarda,* are striking manifestations of the truth of this hypothesis. Mention may be made of

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(3) Penn. Med. Jour., May, 1922.

the pigment degenerations of the chorioid and retina, the familial types of atrophy, the various nyctalopias, the developmental defects of lens and cornea, and the congenital anomalies of intra-ocular tension. The acceptance of tuberculosis as a ready-made etiologic factor in disease covers a multitude of sins. The close resemblance of incipient phthisis to certain hyperthyroid states and the errors consequent on a disregard of this well-established similarity, has its lessons for clinical ophthalmology. The recurrent hemorrhages of adolescence, of which intra-ocular effusions formed no small part, were attributed, largely on the basis of a positive reaction after diagnostic tuberculin injections, to a purely bacterial or rather to a bacteriogenous origin. We are beginning to recognize the endocrine factor in abnormal vascular reactions, particularly those at puberty and at the opposite pole of sexual function, the climacteric, and to study the applications of these data to the intra-ocular circulation and intra-ocular tension.

In the acute attack of glaucoma, former theories of increased intra-ocular tension have been concerned with purely mechanical factors such as hyperopic refraction, comparatively large lens, a narrow iris-angle, more or less inelasticity of the capsule of the eye, particularly of the sclera. Later, attention was paid to the chorioidal vessels, the intra-ocular lymph circulation, exosmosis and endomosis, the tonicity and concentration of the intra-ocular fluids.

Still more recently, colloidal chemistry was invoked, and recognized in glaucoma an essential edema of the vitreous. Endocrinology, or as it might more properly be called, neuro-endocrinology, gladly accepts the truth in all these theories, and adds its own. Glaucoma comes on at a time of life which is characterized by a typical dyscrinism (relative hyperthyroidism); it shows a marked predilection for a race, the Hebrew, which is decidedly hyperthyroidic, emotional and neurotic. The clinical manifestations, the depressions, the intense and radiating pain, the systemic disturbance, vomiting and so on, are signs of a severe endocrine storm. It is striking and significant that all our therapeutic measures, short of the surgical procedure which is finally invoked as a radical and mechanical measure to change completely the structural conditions of the eye, are one and all based on the restoration of the endocrine principles and on stimulation of the vagus by rest, sleep, heat, hot coffee, morphine, pilocarpine *per os* and by hypodermic, the instillation of strong miotics. A recognition of a glaucomatous tendency as an attribute of the hyperthyroid individual or age suggests the early use of pituitrine, and the systemic administration of minute doses of the vagotonic alkaloids such as eserine (physostigmine), pilocarpine and possibly muscarine and nicotine. Graves' disease is admittedly a hyperthyroid manifestation. The excessive sympatheticotonia caused by this condition may lead to either end station, glaucoma or exophthalmic goiter, and the mechanical, structural, ocular features mentioned above may come into their pathogenetic, etiologic estate as determinants of the path which shall be taken by the nerve influence. With a vagotonic eye structure, characterized by a stiff sclera, large lens, small pupil, the outcome is apt to be sharp and sudden—the acute attack of glaucoma. With a myopic refraction, soft sclera, large pupil, and deep anterior chamber, the balance of intra-ocular tension withstands even the excessive demands imposed by sympathetic irritation.

In addition to the systemic and somatic signs of endocrine tendency, we have some fairly definite ocular manifestations. The two types which seem to be clearly established are the pituitary and the thyroid. The pituitary eye is recessed, enophthalmic, with a small lid fissure, contracted pupil, and a tendency to marked pigmentation and hyperopoic refraction. This type shows a vagotonic reaction; that is, stubbornness to mydriatics and susceptibility to small doses or weak concentrations of miotics. The vagotonic tendency is indicated further by spasmophilia, expressed as convergent squint, accommodative spasm, blepharospasm, persistent headaches, hemicrania, plastic iritis probably, and often associated with vagotonic (spasmophilic) manifestations. The hyperthyroidic eye shows a tendency toward the type seen as a pathologic extreme in Graves' disease. Exophthalmos, mydriasis, large lid fissure, vascularity of conjunctiva and lids, and a tendency to epiphora, subnormal accommodation, defective convergence and the various asthenopias. Myopia and lack of ocular pigment are associated, not infrequently, with a tendency to low-grade vascular degenerations of the chorioid and retina. If we are correct in our assumptions, it seems logical to treat our vagotonic, pituitary types, not only by careful correction of refraction error and muscular imbalance, but in addition, by the internal administration in small doses and over a long period of the specific alkaloids (miotic or mydriatic) indicated by the typical reactions, as well as by more specific endocrine therapy.

These considerations and observations may help to explain some of our failures, as well as some of our successes, in the treatment of eyestrain with cycloplegics.

Etiologic Relation of the Eye to the Endocrine Organs. Considering only the experimental and clinical aspects of the relationship between the endocrine organs and the eye, W. Zentmayer[4] finds that in dogs, extirpation of the thyroid gland is sometimes followed by a porcelain-white infiltration of the cornea which leads at times to ulceration and ectasia. Blepharitis, lachrymation, conjunctivitis and partial blindness without ophthalmoscopic changes, have likewise been noted after removal of this gland. In the course of the tetany following thyropriva, spasm of the ciliary muscle

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(4) Penn. Med. Jour., May, 1922.

has been observed. As a sequel of complete excision of the thyroid and parathyroids interstitial keratitis and bilateral cataract have been seen.

The effect of parathyroidectomy on the calcification of the dentine and enamel leads to fracture of the teeth and to a decrease in lime secretion and bone salts and points to deficient parathyroid secretion as a probable cause of the syndrome of "blue scleras and friability of the bones." There is experimental evidence that many convulsive disorders of man (convulsions of children and eclampsia) are due to parathyroid insufficiency, and from this it may be assumed that a deficient parathyroid secretion has an etiologic bearing upon zonular cataract.

Clinical Evidence: At present we have no direct evidence that the ocular complications of disease of the pituitary body are produced other than by direct pressure and increased intracranial tension; but the "antecedent amblyopia" of deSchweinitz, the frequent variability and at times transient nature of the disturbance of visual function, the beneficial effect of glandular therapy on the amblyopia in some cases of undoubted hypophyseal disease, and the fact that oculomotor disturbances have been met with, due to change in the basal nerves not the result of pressure, suggest that disturbed secretion of the pituitary gland may also be a factor, especially in the early stage of the affection.

Affections of the Thyroid: The ocular symptoms of hyperthyroidism are too well known to require detailed consideration. There is no constancy in their appearance and they stand in no relation to the gravity of the toxemia. The exophthalmos is of special interest to the ophthalmic surgeon as it may reach a degree endangering the function or even the integrity of the eyeball. Among the more recently described symptoms is one by Suker under the term "deficient complementary fixation in lateral eye rotation," which is sufficiently descriptive of the phenomenon. The importance of this sign has recently been emphasized by Jackson and Wilder. Especial mention may be made of the occurrence of an ocular vascular *bruit* because Riesman has recently again called attention to it, though some contend that the sound heard is not a vascular *bruit* but is due to the activity of the orbicularis muscle.

Athyroidism: In myxedema, in which the changes in the thyroid are chiefly atrophic, edema of the lids with the consequent narrowing of the palpebral fissures is the most marked ocular phenomenon. The edges of the lids are hyperemic, the eyebrows are elevated, and the hairs and lids cilia are sparse and brittle. Subconjunctival hemorrhages may occur. Lachrymation, asthenopia, neuroretinitis and superior-temporal contraction of the visual fields are occasionally met with. The oculocardiac reflex has been found enormously intensified. This, according to Petzetakis, results from the sympathetic being deprived of the normal stimulation of the thyroid.

In cretinism, which has been called juvenile myxedema, along with the ocular symptoms met with in myxedema there is a wide spacing of the eyes. In Mongolian idiocy, suspected by some to be of thyroid origin, the eye symptoms of epicanthus and convergence of the palpebral fissures have given the name to this affection.

Interesting clinical evidence has been contributed by Krauss that thyroidectomy may be complicated by papilledema. The operation was followed by a toxemia which induced tetany and the ocular condition was observed eight weeks after the operation. Westphal and Schiller saw bilateral cataract follow thyroidectomy. In both instances tetany preceded the development of the lenticular opacity. The occurrence of tetany in all of these cases suggests that interference with the parathyroid was probably the essential factor in the postoperative symptoms.

A note of warning has been sounded against the tendency on the part of enthusiasts to link up the endocrine organs with the etiology of obscure disease. No doubt this adverse criticism is justified. Nevertheless only good can result at this time from calling attention to suggestive symptoms which have been noted in some eye conditions, the etiology of which up to the present has been in doubt. Fisher believes that so-called hereditary optic atrophy is primarily due to an inherited temporary disorder of the pituitary body. He bases his assumption on the neuropathic type of the affected individual, the similar symmetrical field defects noted in some cases, the occurrence of subjective phenomena of light and colors, the epochal relation between the onset and the period of puberty and the climacteric, and that in both conditions, frequently in the early stage of the disease, a very mild papillitis may be detected. In one instance a honeycombed shadow in the depression of the sella turcica was found.

Jones believes that there are general as well as ocular symptoms indicating disturbance of the ductless glands as the cause of pigment degeneration of the retina.

Amaurotic Family Idiocy: The myasthenia, the periodic convulsions, the familial type of the disease, together with the fact that lesions have been found in the suprarenals, thymus and thyroid, and furthermore that the symptoms of Sach's disease resemble those resulting from epinephrine insufficiency have led Sajous to the belief that the disease is produced by a toxin which provokes organic lesion in the ductless glands, particularly the suprarenals.

Recurrent retinal hemorrhages of adolescence are possibly due to some other factor besides tuberculosis, and this may be found in the adrenals or other ductless glands.

Klemkowski claimed as the result of biologic clinical tests to have found adrenalin present in the blood of glaucomatous patients. Later investigations by

Löhlein, Vogt, Joffe and Kausama failed to confirm such findings (Elliott).

Ocular Manifestation of Syphilis. There are many atypical forms of syphilis and there are many individuals who have been infected with syphilis and who have lived the alloted span of life and who have never manifested any of the symptoms or signs usually presented in this disease. The initial lesion is often never observed by the patient. However, it certainly appears, runs its course, often very mild, and then disappears with the patient wholly ignorant of its presence. The same may be said of the secondary stage of eruption. Especially in ophthalmology it is very rare to get a history of eruption, for the patient will often and, honestly, disclaim any knowledge of a secondary eruption.

E. F. Garraghan[5] lays special emphasis upon the great importance in treatment of disease of the eye, of always keeping in mind the possibility of syphilitic taint. "We remove a foreign body from the eye and the patient makes rapid and uneventful recovery. But this same little foreign body may be the exciting cause of a severe inflammation which may terminate in the destruction of the eyeball. The foreign body may be the means of stirring up an old syphilitic taint which had been quiescent for years and it only remained for the slight ocular injury to set in motion the destructive elements of the disease."

Two cases are described, in both of which syphilitic history was denied, but in each case the foreign body was the exciting cause which stirred up an old syphilitic taint which had been dormant in the individual for years.

It is important to fortify ourselves with a Wassermann or similar test, in these cases. No one has so exalted a position that he should be exempt. Saint or

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(5) Illinois Med. Jour., April, 1922.

sinner should be subject to the same rule. "You will be surprised at the number of positive Wassermanns you get among the saints."

Blindness and Venereal Diseases. In 155 out of 189 pupils in the Missouri School for the Blind whom H. D. Lamb[6] submitted to the Wassermann test there were nineteen, or 12.3 per cent., in whom syphilis appeared to be of evident etiologic significance.

The only other report of this nature is that of Igersheimer in 1911, who found that syphilis played an etiologic rôle in 13.4 per cent. of 189 blind children examined. If the number of blind from ophthalmia neonatorum be added, Igersheimer's percentage is increased to 27.8 per cent. for venereal diseases.

In Lamb's statistics there were forty-one cases of blindness from ophthalmia neonatorum, which increases the incidence of blindness due to venereal diseases to 34 per cent.

Temporary Hysterical Blindness. H. J. G. Koobs[7] describes a case of sudden blindness in both eyes in a girl of 15 who had been under treatment for some time for defective vision due, as thought, to systemic intoxication. In the belief that the sudden blindness was connected with paranasal sinuitis, the posterior ethmoid and sphenoid sinuses on the right side were exenterated without finding much pathology. The further developments in the case suggested hysteria and blindness finally ceased under suggestive treatment.

Koobs thinks that perhaps if in this case more attention had been given to testing the sensation in various skin areas and to the reflexes the diagnosis of hysteria might have been made at first and the nasal operation avoided.

For a retrobulbar optic neuritis to cause this sud-

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(6) Jour. Mo. State Med. Ass'n., March, 1922.
(7) Journal-Lancet, April, 1922.

den blindness, involving both eyes simultaneously, the lesion would almost have to be at the chiasm and be produced by an edema within the nerve sheath or by compression from without; and while it is difficult to explain how the pupillary reflex to light (particularly the consensual reflex) could persist in that condition, the fibers of the pupillary reflex arc might resist compression longer than the fibers carrying sight impressions and thus function longer.

The existence of a chorioretinitis in this case, which can not be accounted for, however, rather directed attention away from the nervous viewpoint.

The Eye as a Signal of Disease. Frequently the symptoms, collectively covered by the term asthenopia, are manifestations of bodily ailments in general, as opposed to local (ocular) disturbance.

As pointed out by W. G. M. Byers,[8] the nervous apparatus of the eye forms an appreciable part of the brain's bulk; and the eye participates through intimate connections with practically every one of the various cerebral functions. As all toxemias affect the central nervous system, it follows that asthenopic symptoms must frequently form part of the clinical pictures of systemic diseases; and ocular symptoms of local origin are necessarily heightened by systemic disturbances of any sort.

The symptoms covered by the term asthenopia are: Headaches, generally frontal in situation but not infrequently located in the occipital region. Typically, these subside with rest, and develop in association with use of the eyes for near work. Mental confusion of slight degree is occasionally complained of; but quite frequently one notes impaired power of concentrating the mind, and drowsiness. On the other hand, eye-strain is undoubtedly, at times, a cause of disturbed sleep, if not of actual insomnia. Vertigo in varying degrees is a common symptom, and is especially marked

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(8) Canadian Med. Ass'n. Jour., November, 1921.

in those cases in which the extrinsic muscles are involved. Nausea (rarely vomiting), feelings of distress in the region of the stomach and over the heart, fill out the general picture. As purely local manifestations there are blurring of the sight, sensations of heat and burning and grit in the eyes, as well as heaviness of the lids and aching and fixity of the globes.

It is a common experience to note some of these symptoms after confinements and major operations, during periods of nursing, and following prolonged application to work. The same can be said of loss of sleep, grief, and anxiety, indeed, the artificial conditions of life under which men are compelled to live in the larger communities especially, are in themselves a frequent cause of a general asthenia which expresses itself in eye fatigue. It was noted that hundreds of men who went to the front were able to discard their glasses in consequence of the betterment of health that resulted from a more vigorous life in the out-of-doors; and one now sees these same men obliged again to wear their lenses on resuming their old positions.

The bodily ailments which may express themselves in asthenopic symptoms cover the whole range of medicine.

It must be obvious that only a physician, with a thorough special training, backed by a solid grounding in general medicine, is competent to look after any phase of eye work. A man so trained will divide his patients into three groups: those whose symptoms are in all probability of ocular origin; those whose symptoms are in all probability merely an expression of some general disturbance; and borderland cases.

The first group of cases will respond wholly to the treatment of the oculist; the second group falls to the general practitioner alone for solution; but in the third group the problem calls for close coöperation between the general practitioner and the specialist and a careful "follow-up" in the interest of the patient.

With discretion, glasses and local remedies may be tried out for a time to estimate exactly what part eye-strain plays in the production of the symptoms; or general measures may be first tentatively introduced; or combined local and general remedies may be prescribed from the outset.

The "Doll's Eye" Phenomenon. Dissociation between the movements of flexion of the head and looking downward is called the "dolls' eye" phenomenon. O. Cautelli[3] says that this symptom may be noted in the sequel of certain cases of lethargic encephalitis. In cases in which the phenomenon is not spontaneously produced in moderate flexion movements of the head, if the patient is ordered to look far before him and if at the same time the head is strongly flexed on the chest the eyes will be seen to remain immobile during this movement.

The "doll eye" phenomenon is due to bilateral lesions situated in the mesencephalus or in the portion of the cortical faisceau which after having abandoned the principal faisceau became connected with the motor cells presiding over the conjugated movements of the head and neck. In all cases which Cautelli observed, it was accompanied by lesions in multiple foci.

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(3) Riforma Med., Aug. 20, 1922.

The Ear

ALBERT H. ANDREWS, M. D.

DISEASES OF THE EAR.

THE EXTERNAL AUDITORY CANAL.

FOREIGN BODIES IN THE EAR.

Removal of Foreign Bodies from External Auditory Canal. In the experience of Joseph Friedman,[1] foreign bodies in the auditory canal that have required more than the ordinary methods for their removal have been those that had previously been tampered with and particularly by faulty and over-indulgent instrumentation. That this over-indulgence can be carried to an almost unmerciful state will be exemplified subsequently.

The foreign bodies that find their way into the external auditory canal are numerous and of great variety. Almost every conceivable object of a size small enough to permit of its entrance into the auditory canal may find lodgment there either accidentally or intentionally. The wilful insertion of foreign bodies into the canal is not only a most pernicious habit prevalent among children, but some adults also indulge in this practice. Shoe and collar buttons, glass beads, kernels, seeds, pieces of chalk, pebbles, beans and peas, pieces of matchstick and pencil lead, shot, cotton plugs, and various insects such as flies and bugs are some of the articles encountered.

The presence of a foreign body in the canal *per se,* is not of very great consequence, providing, of course, it is not of such size as to exert undue pressure upon the walls of the canal with subsequent irritation; or, by reason of its size and location, to cause interference with audition. A foreign body not too large to obstruct the lumen completely may remain in the canal for an indefinite length of time without producing any injury to the

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(1) Med. Record, Aug. 27, 1921.

ear or inconvenience to the patient. As a matter of fact, the patient may not be conscious of its presence, and cases have been reported in which foreign bodies introduced in childhood were accidentally discovered in adult life. There is greater danger to be feared in those cases in which interference has been instituted. Forceful and injudicious attempts at removal have often resulted in fracture of the walls of the meatus with subsequent serious involvement of neighboring structures. Not alone has the foreign body been driven against the drum, with laceration of the canal walls and destruction of the drum membrane, but with persistence it has been driven through the drum into the middle ear, where it has become impacted, and in this location removal through the canal is almost impossible. Not alone has an ear been frequently rendered functionless, but even death of the patient has been known to ensue.

No one is justified in jeopardizing the usefulness of the organs of hearing or endangering the patient's life because of lack of knowledge and familiarity with the conformation of the external auditory canal and the location and slope of the drum membrane, associated with inexperience and the employment of unsatisfactory and improper instruments. The necessity of refraining from introducing various instruments into the ear, especially when the foreign body with ordinary examination is hidden from view, can not be too strongly impressed upon the general practitioner. Groping about blindly in a narrow irregular canal can never accomplish anything but harm to the patient, which only too often becomes of a most irreparable nature.

A history of the introduction of a foreign body into the auditory canal of a child is no criterion that a foreign body is present. Not until we have obtained a satisfactory view of the object can we be assured that the patient's statement is correct. One can readily see, therefore, that especially in the latter case damage is apt to result from faulty instrumentation. Frequently a curette or a hook is introduced into the canal until it meets an obstruction and then the operator tries to engage what he believes is the foreign body. In his eagerness to extract the object, usually in a struggling child, he lacerates the drum, mutilates the canal walls, or dislodges the ossicles, and with the appearance of a sanguineous discharge from the ear, he withdraws from the procedure and is then willing to transfer the responsibility. Much can be accomplished and a great deal of unnecessary traumatism and pain can be spared these patients if certain facts are borne in mind, and if those factors which govern the selection of the procedure to be employed are assiduously and intelligently considered.

The external auditory canal is a narrow irregular tube about 1½ inches in length. At its inner extremity is situated the membrana tympani, a knowledge of the exact position of which is essential if one is to perform with safety any manipulations in these cases. It should be borne in mind that the direction of the drum membrane is obliquely forward and downward and that in children this inclination is much greater than in adults. Because of this position, the posterior portion of the drum is situated from 5 to 6 mm. nearer the meatus than are the anterior and superior walls. Instruments should be introduced with great caution, therefore, in order to avoid injury to the drum membrane; it is much safer to introduce them along the anterior and inferior walls in the endeavor to engage the foreign body.

Given a case in which the physician has obtained a history, either from the child or from the parents, that a foreign body has been accidentally introduced into the ear, what should be followed in the process of its extraction? To begin with, there must be adequate light, a head mirror, a speculum, and the proper assistance necessary to hold the child quiet so that a good view of the foreign body may be obtained. When the proper assistance can not be had, light anesthesia may be employed to great advantage. That the physician must verify the statement of the patient or of the parents is of great importance. Under no circumstances should interference be attempted unless it has been ascertained that a foreign body is actually present in the canal. Some may advance the proposition that all this precaution is unnecessary; that without seeing the foreign body, the ear syringe may be employed promiscuously without any ill effects to the patient. In some instances this hit or miss affair may drive the foreign body deeper into the canal and what would ordinarily be a simple case to handle becomes a difficult one. This is especially true in those instances in which the foreign body is impacted in the canal occluding the entire lumen. Because of this latter fact the stream of water from the syringe, which is only effectual when we succeed in establishing a return flow behind the foreign body, can not be applied here to advantage, and consequently all that it serves to do is drive the object deeper into the canal and thus increase the impaction.

The method of extraction of a foreign body depends upon its location in the canal, its size, whether small or large (the importance of the latter being the absence or the presence of impaction), its consistency (whether soft so that an instrument can be forced into the object itself and so engaged, or whether an instrument can with safety be introduced between it and the canal wall), and lastly upon the condition of the meatus at the time of examination, *viz.,* whether previous attempts have already been made at removal as evidenced by impaction, inflammation and narrowing of the canal. The majority of cases, unfortunately, that come to the specialist have already been interfered with.

In cases in which the foreign body is not impacted, and in which there has been no previous interference, whether it be internal or external to the isthmus, the employment of the ear syringe, preferably one holding at least six ounces, using plenty of lukewarm water and force, and above all patience, will usually be successful in dislodging the object. In the majority of cases this is all that is necessary. However, if perchance this should fail, we can very easily engage the foreign body by passing a small probe, hook, curette or spoon beyond the object, and then by making pressure against it as the instrument is withdrawn it can be removed. These measures, carried out carefully, should result in no injury to the lining of the canal or to the drum membrane.

In those cases in which the foreign body is impacted, but in which the previous interference has not caused reaction sufficient to render a good view of the object and its location impossible, we must determine whether the impaction is complete or incomplete, *viz.*, whether at one or more points in the circumference of the foreign body there is no contact with the canal wall. If the impaction is incomplete, we may hope for a return flow behind the foreign body, and hence, the syringe should first be tried. If unsuccessful, we may attempt dislodgment by means of a narrow probe or hook inserted at the point where the impaction is incomplete, always exerting pressure against the foreign body and so try if possible to loosen the impaction. This should then be followed with the syringe. In the majority of cases that fall into this category, the procedure outlined will usually be effectual.

If the impaction is complete and the foreign body is external to the isthmus a number of procedures may be tried depending upon the circumstances. If the foreign body is of such a consistency that it can be perforated, or if the mass can be entered, it can oftentimes be loosened so as to render a complete impaction incomplete and then further steps may be employed as above described. Occasionally, especially in the case of kernels, peas, beans or wood, the mass can be shrunken to allow of manipulation by the repeated instillation of alcohol. However, should the foreign body be impossible to enter and if tightly impacted deeply in the canal, then more radical operative measures must be undertaken, especially if complications arise.

Buckshot in the Ear. After accidentally discovering a buckshot in the right ear of a child suffering from left acute otitis media, George D. Wolf,[2] emphasises the following points:

It is important to examine both ears, even if only one is complained of.

It once more impresses us with the danger of attempting to remove foreign bodies from the ear by aid of instruments, even in the hands of the experienced.

In persistent otorrheas, it must be borne in mind that the presence of a foreign body may be the etiologic factor in some cases.

A low temperature does not exclude extensive mastoid involvement.

A single *x*-ray finding must not be relied upon, especially when clinical evidence is against it.

The hospital is the ideal place for any otologic manipulation; and, finally,

Unification of dispensary and hospital must eventually lead to great benefit for both the attending physician and the patient.

EAR INJURIES FROM SEA BATHING.

Sea Bathing and Its Effects on the Ears. The various ear diseases occurring during the bathing season have, according to Alexander Rovinsky,[3] attracted comparatively little attention from either the general practitioner or the otologist. This is rather puzzling, inasmuch as the number of ear cases in special ear clinics, as well as under the care of every more or less busy aurist in private practice, point to an undoubted increase in ear troubles that can be traced directly to bathing in the sea, especially in the months of July, August and September, and the va-

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(2) Western Med. Times, January, 1922.
(3) Med. Record, July 2, 1921.

riety of affections runs the whole gamut of pathologic ear conditions, from a comparatively innocent circumscribed furunculosis of the external ear up to an involvement of the mastoid with all its possible consequences. The subject deserves special interest, the more so as proper instruction of patients and a little painstaking on the part of the medical man in becoming familiar with the harmful possibilities of improper sea bathing may prevent many an acute ear disease, as well as dangerous exacerbations of chronic dormant conditions. Elementary as it may seem, it must nevertheless be observed, *en passant*, that the entrance of the sea water with its contaminating contents into the middle ear is not effected through the external meatus (assuming the drum to be intact), but by way of the Eustachian canal, which is directed downward, inward and forward, and whose pharyngeal opening is somewhat deeper than the opening into the tympanic cavity. It is assumed that the walls of the canal approximate each other in its middle portion, but open up during the act of swallowing. We have all of us experienced while diving or when submerged by an oncoming wave the irritating effect of the sea water entering through the mouth or nose into the posteriour pharynx, as evidenced by a sense of choking and by uncontrollable coughing, and an impulse to swallow, thus forcing the water into the middle ear. To be sure, a defective drum or one absent altogether presents an even more direct avenue for the entrance of the sea water.

A patient who has thus forced some water into the middle ear will complain of stuffiness, somewhat impaired hearing, occasionally slight tinnitus, but usually no pain. All these symptoms point to a mild degree of irritation of the Eustachian canal due to obstruction, which in its turn disturbs the normal equalization of the air pressure between the external air and the middle ear space; the ventilation of the tympanic cavity is thus interfered with and sound transmission is affected. In a recent case, and one of normal Eustachian canal and middle ear, careful catheterization of the canal, possibly repeated within twelve or twenty-four hours, will usually be sufficient to empty the tympanic cavity of the few drops of sea water and bring it back to its normal condition. When of longer duration, it may cause an Eustachian catarrh which may spread to the middle ear. It may not be amiss to note here that the introduction of the Eustachian catheter is greatly helped, even in experienced hands, by a preliminary cocainization of the respective nasal fossa, as well as the pharyngeal opening of the tube.

Otitis externa, whether circumscribed or diffuse, when brought on by sea bathing, does not differ clinically from that induced by other etiologic factors, although as a general rule it is of a milder type. A day or two after bathing the patient will complain of discomfort or even slight pain, possibly itching in the ear; this latter impels him to scratch the respective spot either with the bare finger, or, if deeper situated, with a pencil point, match, toothpick or what not. As a result the condition is aggravated and the pain becomes more and more marked. It is to be observed that the nearer the inflammation, whether a mere hyperemia, infiltration, or a fully developed matured abscess, to the meatus of the external auditory canal, the slighter the pain, though as a general rule the tenderness is very pronounced, no matter how slight the affection. Anatomically, the soft structures situated more externally yield more readily to stretching by infiltration as compared with the deeper portion of the canal with its unyielding osseous framework.

In pronounced cases, the pain is not limited to the ear alone, but may be felt diffused all over the side of the head, and even down the neck, and is considerably aggravated by the process of mastication—a very characteristic symptom which is frequently of great assistance in differentiating this condition from an acute middle ear disease. Hearing is usually not affected, except in those rather severe cases in which the swelling is so extensive as to cause by its very size occlusion of the canal, and thus interfere mechanically with the transmission of sounds. We often find considerable swelling behind the ear, so much so as to push the lobe forward, thus simulating a possible mastoiditis. In severe cases attended by fever, headache, general malaise and an obstructed canal that prevents the inspection of the drum, there may arise some difficulty as to the differential diagnosis between a severe external otitis and an impending mastoid. The onset, the previous history, pain on drawing up the auricle, a very characteristic symptom present in external otitis, pain on moving the jaw, and so on, will assist in differentiating between the two conditions.

As regards treatment the writer has for several years resorted to the simple expedient, in cases of hyperemia or even when there is some infiltration, of inserting a plug of sterile gauze saturated with alcohol. The inflamed area is first painted with a solution of silver nitrate, and the plug should be inserted to fit in snugly, but not so tightly as to feel uncomfortable. For the first two or three minutes the patient may complain of increased pain, but this soon gives way to a sense of diffused warmth attended by considerable relief; the patient is instructed to keep the dressing moist by saturating it every hour or two. Rovensky has found in a great many cases gratifying relief from this simple application within twenty-four or thirty-six hours. In more advanced cases, when the infiltration of the tissues is considerable, or when pointing calls for incision and curettage, as in deeply situated furuncles, this dressing keeps the wound clean, and is continued for a time until the healing is started. The alcohol evidently acts as an astringent and dessiccating agent which is at the same time somewhat anesthetic and slightly antiseptic; while the plug acts mechanically by keeping the walls of the canal separated, thus preventing autoinfection.

[Good results have been secured in furuncles and painful inflammation of the auditory canal by the Beers passive congestion treatment. An elastic braid three-fourths of an inch wide is buckled around the neck just tight enough to cause slight flushing of the face. It is worn about twenty to twenty-two hours out of the day. No harm has been observed from its continuous use for a day or a few days.—Ed.]

NEW INSTRUMENT.

New Ear Basin. A new ear basin for use in syringing ears has been devised by W. W. Goldnamer[4] for which he claims the following advantages:

The patient can not readily tip it in either direction, thereby spilling the solution.

The operator can see exactly what he is doing, and can assist the patient if necessary.

It is a size (holding about a pint, or 0.5 liter) that is not likely to overflow, and the foreign matter may be noted when expelled.

It may be readily cleaned and polished (Plate XXIV).

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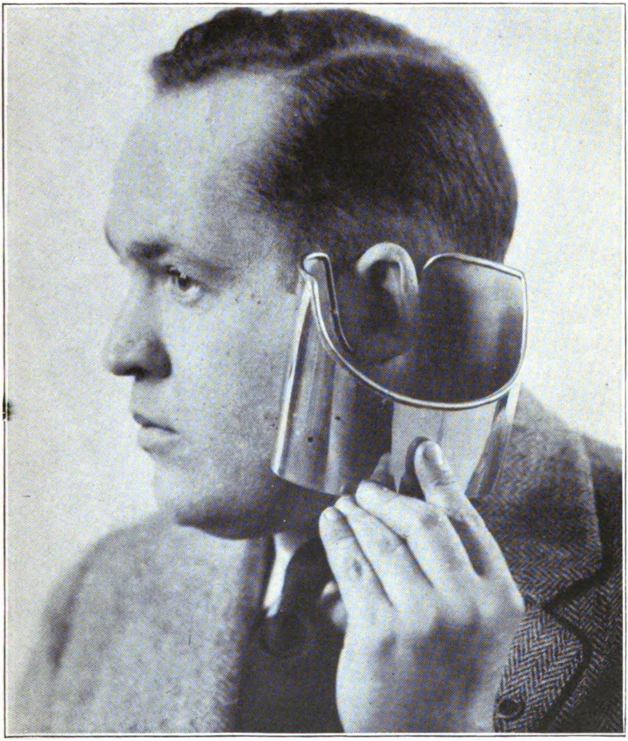
(4) Jour. Amer. Med. Ass'n., March 4, 1922.

PLATE XXIV.



Ear basin.—Goldnamer, page 224.

Hearing as an Asset and How to Enhance and Save Sound Perception by Training Attention and Accessory Muscles. This subject is discussed by J. M. Taylor.[5]

The primary senses were originally considered to be five in number: sight, hearing, feeling, taste and smell. Now the number of senses recognized by the psychologist is in the neighborhood of eighteen. Also there are manifold finer sense differentiations, total about three hundred. Each is regarded as an elementary sense, with special end-organs conveying sensory currents to the brain.

"Feeling" (or touch) is differentiated into elementary sensations of pressure, pain, warmth and cold. Closely allied to this group are the kinesthetic or muscle sensations, evolved during muscular activity. There is also common sensations (cenesthesia), a general awareness above and beyond what can be learned through the percepts. A high degree of this is a valuable endowment, contributing much to common sense, "gumption," or balanced judgment.

One's sensory powers are in almost every instance capable of decided betterment, amplification and elaboration by learning what one possesses of equipment, stock in trade, also what latent powers can be made more available through developing attention and precision.

Hearing is next in importance to seeing. The brain needs to be aroused by hearing quite as much as by seeing, especially in conditions of bodily peril. This knowledge is needful to inform as to direction, distance, as well as the nature, qualities and significance of warning sounds. Keenness of auditory powers is a fundamental requirement; it should be preserved and kept in a high degree of efficiency through purposive training. This education in performance of function may be of the simplest; in particular a fixed intelligent attention and dif-

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(5) Western Med. Times, April 1, 1922.

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especially unusual or impressive sounds, are one of the most compelling influences on attention.

The writer believes that hearing, as a source of pleasure and profit, is neglected much more than vision. We may except of course those whose special occupations or interests lie in the domain of sound production or reception. Few pay adequate attention to auditory possibilities or impairments. The power of music to influence the health of the listener has been recognized and commented on from earliest times, and is a subject so large as here to receive merely mention.

The possibilities of improving states of neglected or impaired audition will thus be noted as encouraging. They consist in emphasizing attention and self-regulation of the patient to his function of hearing; in learning the direction and degree of under-development both in structural and functional neglect, inattention and apathy, and improving the conditions.

The chief objectives are (1) to achieve conscious control over all parts concerned in hearing, direct and associated, *i. e.*, in training of voluntary and semivoluntary structures; and (2) to direct intelligent attention, critical and helpful to elaboration, cultivation and refinement of the function of audition, to bring up to *par* all the latent powers which reside in the aural equipment as a whole.

Procedures: 1. Passive motions, manipulations applied to the structures: Seize the concha with the encircled fingers, draw it up and down, backward and forward, round and round. Apply manipulation to the neck, the posterior scalp—which is usually found rigid and adherent—also the dermal structures over the 2nd, 3rd and 4th thoracic vertebrae (vasomotor subcenters) by pressure and relaxation, by lifting and pulling the overlying skin, and also by mobilizations of the joints of these vertebrae at corresponding levels by alternating pressures.

2. Active movements of the jaws, opening widely as

ferentiation through our ears to familiar and unfamiliar sounds. Heedlessness in listening is the foster brother of stupidity, and opens the gates for losses of valuable information and thus exposes one to incalculable losses. Most errors arise through inattention, yet are unforgivable. The loss may be of impressions useful, pleasurable or inestimable. No one can afford to neglect keeping the hearing as good as possible, and it is equally as important to exercise what one has of auditory capacity, so that it shall be always available and accurate. The ear has recently been proven to be also the organ whereby balance, poise, that is, equilibrium, is maintained.

While it is claimed that sense function can only be enhanced by the specialization due to elaborated attention, concentration and sophistication, it is entirely possible that these exercises may and do bring about actual increments in acuity.

Just as there are some persons more largely influenced by sensations of sight, or "eye minded," so are others whose beings respond more acutely to impulses received through hearing, or "ear minded." Some delight in music, thrill to "the concourse of sweet sounds," whether these emanate from systematized, intentionally arranged sound elements or merely from the more generalized, less defined factors which go to make up that entity called by the rather exaggerated phrase "the music of the spheres," assuming by that is meant the composite sonorousness produced by widely acting movements.

Less agreeable or even offensive sounds on the other hand tend to distress an over-sensitive ear, especially at certain times and under diversified circumstances and associations. If this distress be due to mere esthetic over-exaltation, nothing need be said; if an element of abnormality exists, then a careful exploration should be made, and it should be remedied.

However, a continuity of offense through unescapable evil sounds is capable of acting as a serious strain on nerves and mind, inducing distress and damage. Sounds, especially unusual or impressive sounds, are one of the most compelling influences on attention.

The writer believes that hearing, as a source of pleasure and profit, is neglected much more than vision. We may except of course those whose special occupations or interests lie in the domain of sound production or reception. Few pay adequate attention to auditory possibilities or impairments. The power of music to influence the health of the listener has been recognized and commented on from earliest times, and is a subject so large as here to receive merely mention.

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2. Active movements of the jaws, opening widely as

possible, rotating, side to side, forward and back, also yawning and swallowing afterward.

3. Active movements of the neck, to the right, to the left, also thrusting the chin forward each time, then chin up vertically, forward and back.

4. Inducing the patient to seize the back of his head with hands clasped and to bend far forward and down, then resisting to push the hands back with the head (neck muscles) and repeat five or six times with increasing force.

The whole procedures occupy six or eight minutes and should be repeated at least once, preferably three times daily.

[The ear whether normal or impaired is capable of being trained or "educated" to hear sounds that without training would not be heard. The systematic training of the ear in those who are gradually losing their hearing is important.—Ed.]

Tests of Hearing. Some of the essentials in making the Weber, Schwabach and the Rinné tests are given by G. W. Mackenzie.[6]

1. These tests when carefully conducted afford the otologist the best qualitative means available for determining the anatomic site of the lesion responsible for loss of hearing function, partial or complete.

2. In the hands of a skilled examiner they may, when carefully timed in combination with air-conduction tests with tuning forks, serve as quantitative tests subject to limitations as are other present-day methods.

3. In spite of the above-mentioned facts, there exists too often a looseness in the method of conducting them even by credited otologists. One may observe otologic clinics here and there where an attempt is seldom made to conduct these few simple tests even in patients undergoing treatment for deafness. The explanation for this neglect may be:

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(6) Trans. Amer. Acad. Ophthal. and Otolaryngol., 1921.

(*a*) Forks may not be available, or those that are available may not be suitable for the purpose.

(*b*) Lack of faith in the tests due to carelessness in technique which in turn leads to irregularity in the findings. The same holds true in other fields, whether in photography, laboratory work or vestibular diagnosis. In fact, in anything of a technical nature, careful technique is the one big essential to success.

(*c*) Lack of time to apply the tests.

(*d*) Lack of ability to conduct them.

(*e*) Indifference.

No ophthalmologist can hope to practice his specialty successfully without making careful tests for visual acuity, visual fields and color perception, nor can an otologist hope to practice his specialty successfully and neglect the subjective hearing tests that call for no more time and skill than is required of the ophthalmologist in the making of his special tests.

These tests are the best qualitative means available for determining the site of the lesion responsible for loss of hearing. To be sure, with the otoscope one is able to inspect the drum membrane and determine the presence or absence of retraction, dullness, opacity, increased or diminished mobility, etc., which when present tell us that the middle ear is involved; but from the otoscopic appearance alone one can not say positively that the middle ear condition is responsible wholly or in part for the impairment of hearing in a given case. The history may afford some assistance, but it is not always to be depended upon, for it may be found by the functional hearing tests that the hearing is impaired by reason of a lesion in the perceiving apparatus, a neurolabyrinthitis.

Experience teaches us not to rely absolutely upon otoscopic appearances. When it comes to estimating the amount of hearing function, we frequently find the otoscopically worse appearing ear to be the better hearing one. It is not a rare occurrence to find a membrane appreciably retracted with good hearing, in some cases approaching normal. On the other hand, the functional hearing tests, carefully conducted, can not deceive us. They can, however, if loosely conducted. Therefore the plea for careful technique is again emphasized.

After having obtained accurate and well-balanced findings, it is essential that the otologist possess a sufficiently wide knowledge of the subject of otology, to interpret them properly.

In a little more than half the number of cases we are called upon to treat, the findings will be found to correspond typically to a disease of the conducting apparatus pure and simple, unilateral or bilateral, or to a disease of the perceiving apparatus pure and simple, unilateral or bilateral. In somewhat less than half the number, the findings will not correspond typically to either of these conditions, but will suggest a mixed condition, unilateral or bilateral, or even a disease of the conducting apparatus of one side combined with disease of the perceiving apparatus on the other. In fact, the variety of combinations is legion. In all of them it is essential for successful treatment that the examiner should be able to determine just how much one part is involved and how much the other. Furthermore he should satisfy himself as to whether the involvement of the one part is primary or secondary to the other. Finally, if they are not associated conditions, which of the two antedated the other.

Of first importanec in making these tests is the selection of a suitable fork. Ordinarily the three tests (Weber, Schwabach and Rinné) are conducted with the C fork of 256 double vibrations, weighted at the end to suppress overtones.

The Weber test: The intention of the Weber test is to determine whether the sound of the vibrating fork is heard better on one side than on the other, or equally well on the two sides when the tip of the handle is pressed moderately firmly against the skull just below the hair line, midway between the ears. The fork should never be applied to the teeth, since it is insanitary to say the least; besides in the presence of a maxillary sinuitis of one side, the secretion contained in the cavity, together with the thickened mucous membrane, will tend to impair the conductivity on that side.

In the presence of normal hearing, the patient does not lateralize the sound. In the case of unilateral disease of the conductive apparatus, the sound is referred to the diseased side. In the case of bilateral disease of the conductive apparatus, the sound is referred to the worse hearing ear. In the case of unilateral disease of the perceiving apparatus, the sound is referred to the normal hearing ear, and in bilateral disease of the perceiving apparatus, towards the better hearing ear. In the case of disease of the conducting apparatus of one side and perceiving apparatus of the other, it will be referred to the side with the conducting apparatus disease. In the case of bilateral mixed condition (middle ear disease with secondary internal ear involvement), it will be referred to the side with greater amount of middle ear involvement, or the side manifesting the less amount of inner ear affection.

The object of the Schwabach test is to determine whether the patient's bone conduction is better or worse than normal. This can be more accurately determined when it is timed with a stop watch than when it is merely guessed at. One must be sure that the control is normal, which can be ascertained only after making repeated comparison tests with other normals. If the examiner is not normal, he must be careful to select an individual who is normal for use as a control.

When making the Schwabach test, the examiner should be careful to apply the fork to corresponding areas over the mastoids of the patient and the control with equal pressure, for the more firmly the fork is pressed on the mastoid the better and longer it is heard. Attention should also be given to the possibility of fatigue of the hearing organ. For instance, if a vibrating fork is applied to the mastoid of anyone, normal or otherwise, and is steadily held there for 20 seconds or more or until it is no longer heard, and then removed for 5 or 6 seconds and reapplied to the mastoid, it will again be heard.

During the 20 seconds or more it was first applied to the mastoid, the hearing organ became fatigued when the find sound could no longer be heard. During the 5 or 6 seconds pause, recuperation occurred sufficiently to permit of hearing again an even less intensive sound than was possible when the organ was fatigued. To lessen the chances of fatigue, it is well to avoid applying the fork when it is vibrating too loudly. By the time this test is reached, one can generally estimate about how long the patient will probably hear the fork on the mastoid, and begin applying it 20 or 30 seconds before it is supposed the hearing will cease. At the same time attention should be paid to rests. The best method is to interrupt its application every 2 seconds, that is to say, apply the fork for 2 seconds, withdraw it for a like period, thus alternating until the patient is sure that he hears it no longer. Again, this alternating interruption allows the patient a better opportunity to determine the difference between feeling and hearing the vibration, which at times is quite difficult with many patients when the fork is applied continuously.

The Rinné test is designated positive when the air conduction is better (that is, longer) than bone conduction, negative when air conduction is less (that is, shorter) than bone conduction, and neutral when bone conduction and air conduction are equally well perceived, that is, one is no longer than the other.

In making this test, the same precautions are necessary as when making the Schwabach test as to the position on the mastoid to which the fork should be applied. Besides, the same attention should be paid to the amount of pressure with which it is applied, and also the same care should be exercised in avoiding fatigue of the hearing organ. In addition to these precautions, one must be careful to hold the fork in a definite manner and at a definite distance from the meatus while taking the air conduction, at the same time avoiding fatigue after a similar manner as when taking the bone conduction.

A fork held horizontally will not vibrate so long as one held vertically, because when held horizontally gravitational force plays a greater rôle than when held vertically. Again, it will vibrate slightly longer when suspended than when held upright. When we consider that there are six directions, three of which are at right angles to one another, and three in opposite directions, along which the sound waves travel, and eight lines at 45 degrees to the first mentioned six lines, which are nodal lines (dead lines) where the sound waves from the primary, secondary and tertiary axes meet, one can appreciate the importance of holding the fork before the patient's ear being tested and the control in that position which permits of the most direct transmission of the sound waves to the tympanic membrane. For instance, it is not well to hold the fork before the patient's ear best adapted to permit of direct transmission and before the ear of the control in a position approaching a nodal line.

As to the variety of Rinné findings, to say the least, they are numerous and each has a different meaning. To make up a consideration of them all would carry one far beyond the limits of a single paper.

[While in making the Schwabach test the patient's hearing is compared with that of some one who is supposed to have normal hearing a better plan is to standardize the fork used by finding the average time a number of normal ears can hear it. In recording the tests use fractions letting the denominator represent the time the fork should be heard and the numerator represent the time the patient hears it. The fraction will thus show the amount of impairment.—Ed.]

Prevention of Deafness in Early Childhood. The problem of the prevention of deafness in early childhood is, according to Harold M. Hays,[7] both medical and educational.

Deaf children divide themselves into three classes: Those who are hereditarily deaf, those who are congenitally deaf and those who have an acquired deafness. The so-called deaf-mutes belong to the first two classes and need our attention mainly from the educational point of view. The third class needs our attention both from the educational and from the medical side. Hereditary deafness can be claimed only in those cases in which there is deafness among the ancestors in the direct line. One or two generations may have been skipped, but if one makes use of genealogic tables, such as occur in the writings of Love, Bell and Fay, he will find many cases of hereditary deafness which are directly traceable. Congenital deafness is a deafness which takes place before the child is born, and may be due to a true congenital defect because of an abnormal development, or to syphilis in one or both of the parents. Acquired deafness, on the other hand, comes on after birth, within the first few months or later on in childhood, during the first five years, the result of some febrile disturbances, one of the exanthems or because of certain localized conditions which interfere with the delicate mechanism of the middle ear. Most writers who have studied the subject carefully assert that the majority of cases are the result of neglect of the ears after measles, scarlet fever and meningitis, which may be either of the epidemic type or one of the low grade meningitides so often caused by syphilis. It is a sad commentary on our knowledge of the subject that over 30 per cent. of the inmates of our institutions for the deaf are children who have an acquired deafness which might have been prevented if taken in time.

The removal of tonsils and adenoids is a question of vital importance, particularly in relation to the subject with which we are dealing. Although there

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(7) Jour. Amer. Med. Ass'n., July 23, 1921.

may be innumerable controversies as to whether tonsils and adenoids should be removed or when they should be removed for the purpose of revitalizing the general health of the child, there should be no question about their removal when any sign of ear trouble occurs.

Because of the important part that adenoids play, be they small or large, in interfering with the normal action of the tubal muscle, they should always be removed if the child has shown any tendency toward ear trouble. The large adenoid, in infants, which is of sufficient size to interfere with breathing or feeding, gives enough evidence of trouble to warrant its removal. But it is the small adenoid, often not pendulous from the vault of the pharynx but springing from the region of the Eustachian tube or the fossa of Rosenmüller, which is open to question in the minds of those who have not seen the aftermath, in the form of progressive deafness. No matter how small the adenoid is, no matter at what age it is first noted, be it in the first months of life or during the second or third year, it should be removed as soon as there is any evidence that it is causing trouble, particularly with the ears. Some of these masses may be so small and friable that they can be broken down with the finger without anesthesia, while others will need a more severe operation with the curette under ether narcosis.

As a general rule, the majority opinion is in favor of leaving the tonsils *in situ* until the second year of the child's life, unless they are found to be directly responsible for systemic disease or have been the seat of repeated local infections. However, one must not lose sight of the fact that the tonsils may cause impairment of hearing because of their close proximity to the Eustachian tubes.

The discharging ear has been an infected ear. Certain deposits have taken place in the tympanic cavity, such as the deposit of fibrin and perhaps inspissated pus which may make an alteration in the hearing mechanism which may be permanent. The Eustachian tube may still be inflamed so that no air reaches the middle ear, or else a small perforation dry and crusted over, may remain unnoticed. These are conditions which can be easily remedied at the time but which are sure to leave their mark later on if neglected. All children's ears should be tested after any suppurative condition, and one should not be satisfied until the hearing has been brought back as nearly to normal as possible.

The vast amount of harm that is done to ears during the exanthematous diseases, particularly measles and scarlet fever and meningitis, has seemed to be fully recognized. The ears of the children are well taken care of during the acute stages of the disease, and remedial measures are at once used. Yet if one glances over his histories of progressive deafness later on in life, he finds that frequently there is a history of the trouble having arisen during or after one of these three diseases. Meningitis with deafness often means that the nerve has become affected or that there has been some intracranial affection, and the condition frequently manifests itself at the time of the disease and so is given hopeless attention. But in scarlet fever and in measles, there is either a residual process left or there is a continuation of the catarrhal process which forms part of the disease. The acute inflammation has subsided or the suppuration has ceased and, at the time, the impairment of hearing is so slight that it passes unnoticed. But certain adhesive processes are left which mean permanent impairment of hearing.

All medical men are realizing more and more that they must acquaint themselves with the various factors which lead to deafness in childhood, and with those factors which arise in childhood and bring about deafness later in life. The problem divides itself into three parts: (1) education of parents, teachers and physicians to those factors which give rise to deafness; (2)

the proper interpretation of causative factors in early childhood which can be corrected at that time, and (3) preventive measures which will arise during the routine examination of children's ears.

1. *Education of Parents, Teachers and Physicians as to the Factors Which Give Rise to Deafness:* Certain cases of deafness are due to transmission of weaknesses from the parents, and may be considered congenital. Too much stress can not be laid on the importance of obtaining the history of deafness and the possibility of the weakness of the ear mechanism being transmitted. Such cases are not essentially instances of hereditary deafness, and a great deal can be done to prevent the deafness occurring in the child, if proper care is given to the nose, throat and ears during the early years. When there is a history of deafness in the family, the parents should be carefully advised that any children, the result of their marriage, must receive more careful attention than children who spring from parents or forebears who have never had any trouble of that kind. The duty of disseminating this knowledge rests with the parents, the teachers and the physicians, particularly the latter, who are brought into more intimate contact with the family. The question of whether the educators should go so far as to advise deafened people not to marry is another matter and can not be taken up in detail here. Deaf adults will marry, sometimes intermarry, regardless of any advice that is given them. But the problem becomes a more serious one if there is a history of syphilis in both father and mother or in either of them. One has only to consult well worked out genealogic tables to appreciate this fact. Of course, neither parent may be aware that he or she has syphilis and, therefore, when deafness becomes evident in the child, a blood test should be made on the parents and on the child. It may be possible, if the disease is discovered in time (but this is problematical), that the diseased condition

may be partially or completely overcome. It would be more than worth while to have a census of the deaf taken in each decade to be handed over to such an organization as the Volta Bureau, which could then be in a position to distribute the propaganda so necessary to instruct parents in the proper care of their deaf children.

2. *Proper Interpretation of Causative Factors in Early Childhood Which Can Be Corrected at That Time:* This problem has been taken up in detail in the preceding paragraphs. The laity is sufficiently educated at present to understand medical problems explained to them in a simple way. People have come to appreciate the importance of the acute ear diseases and mastoiditis, and insist that a discharging ear receive proper treatment. But what they do not understand is that the ear which has stopped discharging, and which is still lacking in hearing acuity, is a great menace to the growing child and may mean untold unhappiness later on in life. Some of these problems can be dealt with very simply in childhood, but, if neglected, become one of our hardest problems after the child has gone beyond the age of puberty. If we glance over the causative factors of deafness in adult life, we find that invariably there is a causative factor in childhood which perhaps was not apparent to the individual until it was brought to his attention at this late date. In our various leagues for the hard of hearing, throughout the country, we are trying to work out this problem now, and the possibilities for the prevention of deafness, from the knowledge thus gained, will be very great. In fact, our knowledge has increased so greatly during the last ten years that all of us feel that the next ten years will allow us to bring it more accurately before the public.

3. *Preventive Measures Which Will Arise During the Routine Examination of Children's Ears:* The greatest problem is the routine examination of chil-

dren's ears. Parents are careful about the looks of the outside, but are very careless of the workings of the inside, of their children's ears. During early child life, a child's hearing should be variously tested, by any means at hand, particularly if he has had any acute condition of the nose and throat or of the ear itself. As soon as any trouble is discovered, the advice of a competent specialist should be sought. But parents will always be careless in this regard, and so the measuring of hearing acuity will rest on those who are educating the children. Routine examination of children's ears in school must, in time, become as important as the examination of the eyes and the teeth. We must not rest until it has become so. Nurses can be instructed to make the simpler examinations, and those children who need more detailed study can be separated from the rest and turned over to competent specialists. School clinics should be established and the cases studied in such a way that the children are properly seated, according to the amount of hearing defect they have, or else are sent to schools for the deaf.

One important problem arises here. Most of these children need medical treatment of one kind or another. It is unwise to send them to clinics which are far away from the school and to which they can not come regularly. Clinics must be established in the schools themselves so that, under competent aurists, the treatment can be expedited. Little time will then be lost, and the problem can be more readily studied from the educational and medical standpoint.

Uniform Hearing Tests. In an effort to secure uniform initial vibrations in making hearing tests, Robert Sonnenschein[9] developed the following plan:

The three forks used in making the Schwabach Test and also the Weber and Rinné were Edelmann's A (108 v. d.); second, the weighted C^1 (154 v. d.) [n. b.

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(9)Trans. Amer. Acad. Ophthal and Otolaryngol., 1921.

without weights this fork has the tone of C^1 (256 v. d.) but when weighted as used, has the tone of d sharp (154 v. d.)]; and, lastly, the small A^1 fork (435 v. d.), (v. d. meaning double vibrations as distinguished from single vibrations). The A and the weighted C^1 forks were excited by allowing them to drop of their own weight and height from a perpendicular to a horizontal position and striking the knee. The A^1 fork was held at right angles to the body with the flat surface of the prong uppermost, and a small pleximeter, such as is used by neurologists for testing the patellar reflex, was allowed to drop of its own weight and height from a perpendicular position directly down upon the flat surface of a prong, thus giving a uniform excitation of the fork in all cases.

In normal individuals, bone conduction varies, depending upon many conditions such as age (at or after middle age bone conduction is considerably diminished), although it may differ in persons of the same age. Other factors are the thickness of the cranial bones, the size of the air spaces, such as the mastoid cells, as well as certain anomalies of the skull, depressions, traumatic changes, etc. According to Wanner and Gudden, adhesions between the dura and the bone as well as other traumatic or pathologic changes influence the Schwabach, giving a greatly shortened bone conduction in spite of normal hearing *via* air. The amount of the hair, the tension of the skin, contact with the auricles and the pressure with which the force is applied, all these may cause variations of the bone conduction. Politzer believes that the Schwabach alone is only in rare instances of great value in differentiating between middle and internal ear disease. When, however, the bone conduction is found prolonged, and the Rinné is decidedly negative, the Schwabach aids in making the diagnosis of interference with the sound-conducting apparatus; and where the Schwabach is shortened together with a positive Rinné and impaired hearing, it greatly assists in the diagnosis of an auditory nerve affection. Politzer also states that "as a prognostic sign it is of considerable importance, because cases with lengthened bone conduction are usually more favorable as to their course and the result of treatment than where it is shortened." This dictum, however, we must modify by stating that in typical otosclerosis, where the bone conduction is greatly prolonged, the prognosis in every direction is poor.

Boenninghaus employs a C^1 fork and cautions against using forks much lower than this, as their heavy vibrations cause confusion in the mind of the patient in differentiating between tactile and auditory perceptions. He does the Schwabach by holding the fork against the mastoid in the region of the fossa mastoidea with a firm contact (short of producing pain), and then periodically increasing and lessening the pressure, "thus producing an intermittent stimulation which does not fatigue the ear and at the same time facilitates the determination of the maximum stimulation (Reizschwelle)." If the sound is referred to or is said to be heard louder or entirely in the opposite ear, then of course the bone conduction in the examined ear can not be determined; but indirectly an idea is obtained regarding this ear when the other is examined. If in the second ear the bone conduction is shortened, it is still shorter in the first one; if it is normal in the second ear, it is shortened in the first one; but if it is lengthened in the second ear, it really shows nothing definite about the first ear, which may have a shortened, normal, or even a prolonged bone conduction, although of course not so prolonged as in the second ear. In comparing the patient's bone conduction with that of the examiner, a difference of a few seconds with forks of long vibration time is of no significance. This may be due to several factors such as unequal pressure in applying the forks as well as placing it on the identical spot on each mastoid; to a difference in the attention on the part of the two individuals; or to variations in the thickness of the bone. One must avoid touching the auricle with the fork, as this causes the former to vibrate and give hearing by air conduction, and thus prevent determination of the moment when the bone conduction ends.

TREATMENT OF TINNITUS BY GLAND THERAPY.

Review of Tinnitus Aurium. In reviewing this subject, J. Coleman Scal[1] finds it is a condition in the auditory apparatus in which pathologic sounds varying in type and intensity are produced. It is one of the most distressing affections, especially when the noises are loud and continuous. The sounds may be whistling, buzzing, hissing, blowing, ringing, or roaring. They may be intermittent or constant, high or low pitched and may vary from a very mild to a very distressing condition. These noises are increased by menstruation, pregnancy and lactation.

The origin or cause of this condition has never been understood. Most writers have attributed it to either an interference with sound waves due to tubal obstruction or to the interference of the sound-perceiving apparatus. Other causes given are tubal catarrh, chonic otitis media and auditory nerve irritations. Tinnitus also exists in otosclerosis and toxemias of various types, or may be due to over-indulgence of the sexual function or intoxicants. All writers agree that this condition arises from a stimulation somewhere in the auditory tract, either peripherally or centrally and either direct or reflex. Cases are reported in which the agony and insomnia from these continuous noises were so intense that they drove the unfortunate victims to suicide.

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(1) New York Med. Jour., July 6, 1921.

The success of the treatment of tinnitus aurium by glandular therapeutics depends on the condition being a symptom resulting from gland exhaustion, or due to a deficient activity of the adrenothyroid apparatus. The extract of a gland organ will exert an exciting influence in the same organ so that a sluggish gland can be prodded into activity to a degree quite beyond belief and result in a glandular readjustment. The thyroid gland is undoubtedly largely responsible for the distressing symptom of tinnitus aurium. This can be explained by a thyroid deficiency causing a generalized infiltration in which cellular growth and oxidation is interfered with throughout the body. When this infiltration affects the auditory apparatus we get the characteristic symptoms of tinnitus aurium without any definite ear lesions. Sajous describes this as an anemia of this special sense organ, accounted for by the low blood-pressure present as well as by the poverty in the oxidase, its oxidizing principle, causing impairment of hearing and tinnitus. According to Gake, adrenal insufficiency is a potent cause by producing either anemia and mental fatigue or congestion of the labyrinth.

In a series of sixty cases in which tinnitus aurium existed without any disease of the ear, thyroid extract was the routine gland substance administered. From ¼ to ½ grain three times daily was given, and the patient watched carefully for symptoms of over-dosing. Some patients reported improvement on the third day and others at the end of a week. About 70 per cent. of the patients responded to thyroid. Some of these were free from ear noises in two months, others improved greatly and continued calling at the clinic regularly with the hopefulness of being relieved entirely. In 10 per cent. of this series of cases thyroid either had no effect at all or else the patients were improved but slightly. In such cases, adrenalin substance, total gland, 2 grains three times daily, was given. This produced marked amelioration of the symptoms, but not so quickly or completely as thyroid.

From 10 to 20 per cent. of these cases did not respond to glandular treatment. These were the very old chronic cases in which the patients have been coming to the clinic for the past ten years. One man, aged 60, obtained relief at first with orchitic substance, but this was only temporary, and further treatment with internal glands proved futile. This can be accounted for by a degenerative process of the ductless glands due to old age and resulting in an autointoxication.

Progressive Systemic Deafness as an Endocrine Syndrone. This is discussed by J. G. Callison.[2]

According to present teaching, patients with progressing deafness and tinnitus are to be placed in one of three categories, chronic catarrhal otitis media, otosclerosis, and nerve deafness.

The use of the term otosclerosis to separate the terminal stage of a case of progressive systemic deafness from its earlier manifestations is not justified. In this particular instance the disease has commenced in early life, usually at puberty or adolescence, before ossification is complete, and the course of the disease has been a stormy, rapidly progressive one. The term nerve deafness similarly separates off the group of cases of progressive systemic deafness in which the infiltrations and degenerations are mainly in the nervous mechanism concerned in the act of hearing. In each case, there seems little justification for creating separate entities for the conditions. Attributing them to a systemic disturbance based on a pluriglandular dyscrasia correlates the symptoms in a rational way, making their etiology definite and concrete, and puts their treatment on a physiologic basis. The systemic evidence of this pluriglandular dysfunction accompanying progressive deafness, whether in

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(2) New York Med. Jour., July 6, 1921.

a causal relationship or not, is present in all the tissues and organs of the body. This includes the blood and vascular system, the skin and its appendages, the digestive tract, the nervous system and the genito-urinary system. In many instances the changes in other parts of the body are more marked than in the ears themselves.

The cardiovascular system usually lacks tone. The blood-pressure varies, but is inclined to be low in uncomplicated cases. It is not unusual to find it between 100 and 115 millimeters, and it may be below these figures. The pulse pressure varies and is not constant, but is more inclined to be low than high.

The glands of the skin, sebaceous, ceruminous and sweat, are suppressed or sluggish in their action. As a result, the skin is dry and the patient perspires but little. There is, in advanced cases, a lessening of the cerumen in the external auditory canal. These patients come into the office or clinic on warm days with heavy clothing on, and yet there is no evidence of perspiration. The skin is frequently loose and flabby in texture and not healthy in appearance. Sometimes there is excessive subcutaneous fat, and the skin may then assume a myxedematous hue. The hair is inclined to be dry and brittle and is usually falling out. When the thinning of the hair is far enough advanced to be noticeable, it is most advanced at the hair margins. The hair over the forehead has receded and at a later time the other hair margins may show the change. The hair and beard lose their pigment and turn gray. This grayness is usually more advanced than the years of the patient would indicate. The eyebrows are inclined to be thin, especially at the outer third, where the absence is very marked. This thinness of the eyebrows may have been present always, or the eyebrows may be falling out. The body hair is usually scant in the male.

The teeth are nearly always decayed. It is a common remark in the clinic that these deaf patients do not come for treatment until they have paid all their money to the dentist. The reason for this lies in the fact that the decay of the teeth antedates the onset of deafness. The decay attacks both crowns and roots of the teeth, but the crowns seem to suffer most, as the roots are frequently retained. Apical abscesses are common, both in these retained roots and in apparently healthy teeth. There are exceptions to this observation that the teeth are decayed, but patients with good teeth are rare and are in a group by themselves. They are mentioned here only to exclude them from the general class under discussion. There is a tendency for the teeth to be crowded, if enough of them are still present to judge on this point. In addition to the decay of the teeth, many of these patients also suffer from pyorrhea alveolaris. This is not so universal, however, as the early decay of the teeth. The gums may be receding, or they may be red and inflamed and at the level of the dental interstices continued in polypoid prolongations.

In the gastro-intestinal tract constipation is the rule. A large proportion of the patients with progressive systemic deafness are so habitually constipated that they have already adopted some favorite method of caring for the condition. There is, with this lack of tone of the intestinal wall, an enteroptosis and the intestinal loops lie low in the abdominal cavity. A general ptosis of the abdominal contents may be present. There is, accompanying the constipation, proteid decomposition and toxic absorption from the intestinal tract.

In women, the menstrual cycle is generally out of order. The disturbance may be irregularity as to time, but seems to be more often than otherwise a reduction in the amount of the menstrual flow. This reduction, when not amounting to complete amenorrhea, may require careful questioning to bring out the fact. Each woman seems to think that if there is no excessive departure from the normal then her menstrual condition represents that normal.

There is some increase in the elimination of both calcium and phosphorus in the urine, an increase greater than any change in the temporal bone can account for. The pathologic discussions on the bone changes in the various stages of progressive deafness fail to compare the temporal bone changes with those in other parts of the body.. There are undoubtedly changes in the temporal bone in the way of faulty deposition and absorption of calcium and phosphorus. But whether there is a general change in the bony framework of the body has not been determined, except as may be anticipated from the amount of calcium and phosphorus eliminated in the urine. As the bony metabolism of the body is under unit control through the blood, with some influence from the trophic nerves, there is every reason to think the bone changes are universal. This would account for the blood calcium changes observed in the advanced cases that have come to be called otosclerosis. These changes consist in faulty deposition and absorption of bone salts, with a cellular infiltration in the Haversian canals and along the vascular spaces.

The memory is frequently bad in these patients. They are not mentally active, and lack concentration and mental persistence, and the disposition may be irritable. They have such a list of ailments that it is frequently difficult to control them in history taking, once they are launched on a full recital of their bodily ills. Some of them are phlegmatic, but the rule is for them to assure you that they are very nervous, and this covers a large variety of indefinite conditions. These patients are frequently classed as neurotics and no attention paid to the story of their ailments. They are slow in their responses, mentally and physically. In applying the hearing tests they reply with the utmost deliberation, even when they hear the given sound well, and they use the same deliberation for physical movements during the course of the treatment.

The patients come to the otologist complaining of progressive deafness and head noises, one or both. There is no constant quantitative relationship between these two symptoms. The deafness may be extreme and no head noises present, or the tinnitus may be almost unbearable with a very slight depression in the acuity of hearing. On examination the changes in the drum membrane and in the middle ear are equally inconstant. The drum membrane may show extreme retraction with full acuity of hearing or the drum may be in its normal position, with advanced deafness. Likewise, the drum membrane may be very thick or very thin, with no quantitative relationship to the symptoms of which the patient complains. In the same way, the relationship between the condition of the drum membrane and the Eustachian tube is equally inconstant. The drum may be retracted and yet the Eustachian tube, on inflation, seem to be wide open. On the other hand, the Eustachian tube is sometimes found well closed by the swelling of the mucous membrane, and yet the drum is but little retracted. To put this in the form of a practical statement, the local speculum examination helps but little in making a diagnosis. The functional examination of the ear throws more light on the condition with which we are dealing, and yet the picture is inconstant—hence the varying diagnosis of chronic catarrhal otitis media, otosclerosis and nerve deafness. There is, however, a fairly constant relationship between the length of time the condition has been present, the severity it exhibits, and the functional examination. There is present both a disturbance of the transference or conduction of the sound waves and a failure of the sounds to register—a dulling of the perception apparatus.

Some of these patients show an extreme relaxation of the drum membrane, particularly in its larger, posterior segment. When examined with the pneumatic otoscope the excursions are extreme and the drum appears thin, dry and atrophic. It is so relaxed that it does not seem possible for it to be regenerated into a tense, vibrating structure. This condition of the drum membrane is not important from a diagnostic viewpoint, as the diagnosis must be made from a functional examination of the ear and a physical examination of the patient.

The three periods of life at which progressive deafness most commonly has its onset, are at the crises of life—puberty, adolescence and the menopause, and to this may be added a fourth critical period, the oncoming of actual old age. The severest cases of progressive systemic deafness, the group that supplies the largest number of cases of so-called otosclerosis in later life, are those having their inception at puberty and adolescence in girls. These are the most trying times in their lives, the times of the greatest physical and mental stress, and their ears suffer. In this connection, it must be remembered that the male goes through the same physiologic crises as the female, but as the crisis is less marked, so the ears suffer less. In connection with the onset of deafness at puberty and adolescence, it is to be remembered that ossification is still incomplete, and the result of loss of control of phosphorus and calcium is more destructive and lasting in its results than at a later time in life, when the ossifications are complete. Closely allied with the sexual crises of life as a cause of the onset of deafness is the effect of pregnancy. Many women will state that their deafness had its onset or was made worse during the progress of pregnancy.

Next in importance as a cause of the onset of progressive systemic deafness, after the crises of life, are worry and shock. This worry may be over finances, over one's own health or the health of near friends, or any of the numerous things humanity is given to worrying over. It may owe its inception to a sudden shock or fright.

The onset of progressive deafness may also follow a severe illness. This is more likely to be the result of a toxic condition, such as influenza, or a long-continued chronic illness of an exhaustive nature. On the other hand, the onset may be insidious and without discoverable cause. Patients will come with the first complaint that they are unable to hear the telephone with one or the other ear, and examination will show an advanced state of deafness in that ear, and perhaps a beginning involvement of the other ear, or the patient's friends may be the first to complain of the onset of deafness. Sometimes these patients can not fix within considerable limits the time within which they began to be bothered with head noises and deafness, although they fix the onset of tinnitus much more definitely than they do the onset of the progressive deafness. It does not seem to be established that there is any connection between mild inflammatory conditions in the ear and the progressive deafness. The two conditions are more likely to be coincident than to bear a casual relationship one to the other. One condition is purely inflammatory, the other infiltrative and degenerative in nature.

In the present state of our knowledge, it is not possible to say with certainty which of the glands of internal secretion are involved in progressive systemic deafness. Yet from the known pathology and symptomatology, it is possible to mention some of the glands that are responsible for this syndrome. These include, first, that group of glands involved in the control of calcium and phosphorus metabolism, that is, in the control of bony metabolism; second, there are involved the group of glands concerned in the control of oxidation in the body. These two groups really can be combined into one great group which controls bodily metabolism.

The first and most important of these is the thyroid gland. This gland of internal secretion has a definite control over the oxidations and metabolic activities of every cell in the body. It also exercises a special control over calcium and phosphorus metabolism. But, combined with it in this control of the cellular metabolic activities of the body are the interstitial cells of the sex glands. That the internal secretion of the interstitial cells of the sex glands influences bony metabolism is amply evidenced by the differences in the bones of castrated and non-castrated animals. This control of the interstitial cells of the sex glands over bony metabolism may be limited to the shape of the bones, or it may be limited to the size of the bones, or it may be extended to the metabolism of calcium and phosphorus directly. In the gross, this change is limited to the fact that the bones of the castrated animals are longer and more slender. The castrated animal also suffers a fatty degeneration of his other tissues, particularly the muscular. As a consequence, the muscular and connective tissues suffer from a lack of tone.

In those patients who suffer from a lack of vascular tone and fatiguability, there is also a probable involvement of the suprarenal gland, as it is a part of the function of the suprarenals to watch over vascular tone and relieve fatigue. It is also probable that the suprarenals join with the interstitial cells of the sex glands in keeping up the tone of other tissues of the body, as witness the .extreme asthenia in cases of adrenal involvement, of which Addison's disease is the best known example. In some cases, the pituitary gland seems to have some influence on bony metabolism in a way which is not easy to explain, and in regard to which there is a wide difference of opinion.

It is possible that in those cases of thyroid and sex gland insufficiency that give ear symptoms, the bone changes are more marked in the temporal bone than generally throughout the body, because of some local predisposing factor. The first change is that of infiltration and thickening in the drum membrane and throughout the middle ear and its connections. At a later time, there will be a stage of atrophy. As a result, the connective tissues of the middle ear, including that of the drum, will be of low tone and so will lack vibrating tension. The muscles will lack tone, and these should, under careful examination, show some evidence of fatty infiltration, as should also the ligaments of the ossicles. The connective tissues of the labyrinth and cochlea are also of low tone and lack resilience, and this will in part account for the failure of sounds to register.

It is, however, in the nervous element of hearing that the most profound results of the infiltration and degeneration are shown. The nervous tissues are the most delicate in their adjustments. They do the most work, as judged by oxidations, use up the most energy, have the least reserve store of oxidizable material, and suffer the most profound effects from slight causes of any tissue in the body. The nervous structures suffer the same infiltration and fatty degeneration that is present in other tissues of the body. This extends from the end-organ in the cochlea, through the cochlear branch of the eighth nerve, and on into the perception and interpretation apparatus in the cerebrum. The threshold stimulus is dulled all along the pathway. The end-organs in the cochlea are less responsive, the transmission is less free, and the registration in the cerebrum is interfered with.

The inflation of these patients is to be wholly condemned. The drum membrane, the ligaments of the ossicles and the middle ear muscles are already below normal as to their tone and beginning to relax, and inflation detracts from the tone they have left.

Infected adenoids and tonsils must be removed and abscessed and decaying teeth must be cared for as a part of the treatment. These infections all throw an increased load of detoxication on the glands of internal secretion and render their action less efficient. In instituting endocrine treatment of progressive systemic deafness the glands concerned must be free from as great a load of detoxication as may be and, in so far as possible, permitted to function normally. In pursuing this object, all local infections must be removed. To secure the best results, however, from the administration of endocrines the treatment must be instituted at the earliest possible moment. There will come a time when the degenerative changes have reached such a stage that restoration of function is not possible, and when there may be an organic destruction of nerve endings in the cochlea, or an atrophic degeneration of the organ of Corti, and similar conditions.

The author cautions that no one should make a serious attempt at endocrine treatment unless he has made a study of the principles of treatment and physiology from the viewpoint of the glands of internal secretion. The administration of endocrines is not entirely without danger, and should not be undertaken lightly. There is no routine treatment, and simply because one has secured good results in a given case from a certain capsule is no justification for the routine use of the capsule. There is and must be an individualization in each patient treated. For now, more than ever, we are treating a patient and not a case.

Many of Callison's patients were treated with an adrenospermin compound. These are the so-called thyroid type of patients. If the patient presents both pituitary and thyroid symptoms, then the author is accustomed to begin with a mixed gland substance. It is necessary to prescribe stock formulas in endocrine treatment. The gland substance must be at once made up into a capsule or tablet that will protect it from exidation, and prevent deterioration. The blood-pressure seems to be the key to the control of the treatment. If the pressure is low, adrenal substance is to be included in the treatment. If the pressure is normal or high, then the treatment will consist of a combination of thyroid and sex gland substance, the proportion of sex gland being increased as the blood-pressure increases. The doses must be kept small, as the administration will of necessity extend over a long time.

In these patients, when the administration of endocrines is likely to continue for considerable time the administration must not be continuous. It should be suspended for a week or ten days in each month, and in women this period should begin a few days before menstruation sets in and continue for a few days after it has ceased. Occasionally, in those patients in whom the preservation of the hearing necessitates the continued administration of endocrine substance, there should be intermissions extending over one or two months, or even for longer periods, if the gland deficiency present will permit it.

OTOSCLEROSIS

Theories of the Cause of Otosclerosis. According to J. H. Douglas Webster,[3] there are at least ten different theories as to the cause of otosclerosis. The earliest opinion was that it is secondary to middle-ear inflammation (of mucous membrane or periosteum); later views are that it is a primary condition, either a bone disease or an abnormal development of the cartilaginous remnants in the labyrinth capsule, or is due to vascular conditions (active hyperemia, anemia and venous congestion, each having supporters). Then there are toxic and bacteriologic, internal secretion and chemical theories; and there is the nervous theory, that the sometimes associated degeneration of the labyrinth nerve is primary, and the bone change secondary to this; and the developmental theory, that there is arrested development or degeneration of the organ of hearing as a whole,

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(3) Lancet, Sept. 24, 1921.

central and peripheral. There seems no doubt that many factors can excite its appearance in a predisposed person. Bruhl, in this connection, gives authorities for syphilis, arteriosclerosis, chills, internal secretion changes, latent tetany, rheumatism and gout, uremic intoxication, scrofula, anemia, rickets, osteomalacia, autointoxication, tuberculosis, trophoneurosis and wasting diseases. The hereditary nature is most marked, as with bony abnormalities (polydactylism, multiple exostoses, etc.) and some bone diseases (Paget's disease, achrondroplasia).

Katz was the first (1890) to publish the microscopic findings in a case diagnosed during life as a stapes ankylosis. Toynbee (1863) and Troltsch (1881) had called the condition "sclerosis," and for long it was considered a special form of chronic middle-ear "dry catarrh." Moos, in 1867, and Politzer, in 1893 and 1901, gave reasons for considering it a primary disease of the bony labyrinth, as in the great majority of cases the middle-ear mucous membrane was found perfectly normal, while in many preparations the most marked changes were found in the deeper layers away from the mucous membrane. Specimens were soon noted which showed scattered islets of similar bony changes throughout the petrous bone, with or without stapes involvement. Further, labyrinth atrophy was sometimes met with on the affected or on the opposite side, and Manasse brought forward a nerve-degeneration theory which was supported by many.

Bruhl, in an excellent recent summary of our knowledge of the disease, points out that the facts suggest rather that labyrinth atrophy, when met with, must be secondary (or a postmortem change), Manasse himself having demonstrated a preparation showing stapes fixation without definite labyrinth change, and in his more recent works (1914 and 1917) coming nearer to Bruhl's view that the primary change is in the bone.

As to vascular theories, O. Mayer, Cornet, and Gray have all wholly or largely given up earlier theories of theirs as to its origin in local anemia (arteriosclerosis, syphilitic endarteritis, or thrombosis), and this clears the ground somewhat for a basis for radiation treatment. Mayer now considers it an "undescribed variety of otitis fibrosa," an "osteofibromatosis." Instead of anemia there is increased vascularity, clinically suggested by the sometimes seen "flamingo-red" flush on the promontory; it presents appearances like Volkmann's "vascular ostitis," is a "chronic metaplastic ostitis" (Manasse), and has apparently close relations with osteomalacia. As Ferreri says, there seems "a great affinity" between osteomalacia, rickets and otosclerosis. All the patients in Arcangeli's clinic with osteomalacai also had otosclerosis, and on this relationship Siebenmann's phosphorus treatment is based, whether increased ovarian internal secretion (with hyperemic results elsewhere) or that of other endocrine glands, or calcium (Kobrak) or chloride (Cornet) retention be ultimately at fault. It must frequently at least be an endocrine gland anomaly, as Alexander has found otosclerosis in cretins (human and animal). Gray regards it now biologically as a "variation," a degeneration of the later-evolved auditory as distinct from the equilibrative mechanism of the ear (the latter fully-developed already in fishes, the former appearing with reptiles or early amphibians).

Siebenmann, on the other hand, regards it, on the basis of many histologic researches from his clinic, as an over-development in the labyrinth of cartilage remnants which normally are there at least till adult life (Taniyama), especially in the region in front of and above the oval window. The labyrinth is practically full-size at birth, and if it continues to develop in its confined space (Kerrison), as the skeletal bones normally do, by absorption and new bone formation, there must be marked changes, beginning, in Siebenmann's view, at the boundary of the original cartilaginous and the later periosteally developed labyrinth-capsule.

Bruhl thinks the predilection for the region in front of the oval window is due to the bony stresses set up by the pull of the tensor tympani muscle. Gray thinks that in addition the stresses set up by the continual stapes vibrations sensitize the bone in the neighborhood to new formations or pathologic changes.

Earache as a Symptom. According to G. Sluder,[4] earache is a not uncommon feature in the syndrome of nasal ganglion neuralgia, and may be an isolated manifestation. In these cases, examination of the ear is negative in every way. This fact has been mentioned often in the course of the description of that syndrome.

He has observed nine cases of earache accompanied by more or less congestion of the membrana tympani, one with obliteration of the landmarks without pouting, two middle-ear abscesses with pouting, one general reddening of the membrane with tinnitus, and the others with congestion of the handle of the malleus (Eustachian tube cases) that were relieved by cocainization of the nasal ganglion. In one of the abscesses, the relief was for only a few minutes. In this case, there was reason to think that only a very small part of the cocaine was absorbed. In the other case, the relief was complete, but it did not at all prevent the pain of paracentesis. In the case of reddened mebrane with tinnitus, the relief of pain and tinnitus was complete with one application, and they did not return. This was true of the case with the obliterated landmarks of the membrane, and the cases of slight irritation of the Eustachian tube.

The Douche in Purulent Otitis Media. George E. Barnes[5] discusses the use of the douche in the treatment of acute purulent otitis media.

Irrigations wash pus out of the external auditory meatus and, through the incision in the membrana tympani, to some extent out of the middle ear, but the current of fluid certainly carries infective material from the meatus into the middle ear. Such a procedure can not be said to be based on good surgical principle, and solutions of strong antiseptics can not be used in the ear. Indeed, the avoidance of superinfection and rein-

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(4) Jour. Amer. Med. Ass'n., June 3, 1922.
(5) Ann. Otol., Rhinol. and Laryngol., March, 1922.

fection of the middle ear is one of the cardinal points which should be observed in treating middle-ear disease. Such added infection takes places with remarkable facility. It is a wonder that suppuration ever disappears under treatment by irrigations. Furthermore, as is well known irrigations alone often fail to dislodge all the purulent accumulation in the meatus.

Barnes believes in making use of gravity drainage, absorbent pads in the concha, and meatal cleansing by means of swabs, while the lips of the incision are kept from adhering by use of a spatula.

For good gravity drainage the patient should lie about half or more of the time with the affected ear on the pillow (which should be covered with a towel to catch any little pus that may leak out). Nearly all pus is carried outward along the meatus and is taken up by a rather loose wad of absorbent cotton placed in and filling the concha. This pad of cotton should be changed whenever it becomes saturated on its inner surface, and this is not much oftener than irrigations are practiced by those who believe in them. The concha should be washed with soap and water once or twice daily.

Every day or every other day the physician should very gently swab out the meatus with a cotton wrapped applicator. This little procedure should be done with the utmost care. The applicator should be made of copper wire of about 0.03 inch diameter and of just sufficient hardness to prevent twisting while the cotton is is being rolled on it. Such an applicator has sufficient resilient flexibility so that even when a trifle more pressure is made with it than intended it will bend easily and thus not cause, when correctly dressed with cotton, pain to the patient or injury to the tissues. The ends of these applicators should be triangular in cross section so as to hold the cotton as the applicator is rotated. Before using, the end of the applicator should be slightly bent to correspond with the curve of the inferoanterior wall of the meatus so that pus can be easily gathered up from the deepest recesses.

The flat pledgets of cotton which are to be rolled on the applicator should be carefully prepared. Of course, the hands should be thoroughly cleaned before the cotton is touched, and during the whole seance nothing should contaminate the ends of the thumb and index finger used in rolling the pledgets on the applicator. A thin layer is peeled off from a small handful of cotton, and from it are pulled flat pledgets of a size found to make a swab of just the right size to pass readily through the meatus without friction and to gather up the maximum quantity of pus. The pledget should not be too thin on the end that is to form the business part of the swab, and if thus thin when first pulled off it can be folded back a little. The pledget should be rolled on the applicator only so tightly as to prevent it from coming off during use and to permit ready removal after use. It should be rolled quite tightly about the extremity of the applicator, but the cotton beyond the extremity should form a spongy tuft. This preparation of the swab protects the end of the applicator from injuring the tissues and hurting the patient and furnishes a good absorbent body.

A good method of procedure is first to remove with tissue forceps the pad of cotton in the concha and cleanse the concha; next to cleanse the outer half of the meatus with dry swabs and then with a swab wet with a strong solution of boric acid, and lastly, to cleanse the inner half of the meatus in the same manner, the whole meatus being finally swabbed with boric acid solution and partially dried. Care should be exercised not to make any or but slight pressure against the membrane.

If on inspection the edges of the incision in the membrane are found to be adherent in places and the membrane is still bulging and pulsating considerably, the spatula is gently inserted merely the depth of the incision and passed from one end to the other, avoiding any unnecessary spreading of the lips to prevent the entrance of fresh infection and disturbance of anatomic parts.

Facial Paralysis Complicating Acute Otitis Media. This case is reported by Gavin Young.[7] Eight days after the beginning of an attack of acute non-suppurative otitis media facial paralysis was noted; only palliative measures were used in the treatment of the otitis media.

The condition remained stationary for about a fortnight, and then commenced to clear up slowly. Treatment with the galvanic current was advised, and the facial nerve was functioning normally by the end of a month from the onset of the paresis.

The point of origin of the neuritis can not, of course, be determined with certainty, but it is to be borne in mind that the outer wall of the canal containing the facial nerve, as it crosses the inner wall of the middle ear cavity, is often almost membranous in thinness, and sometimes actually has an hiatus in its bony continuity. This neuritis is analogous to that caused by infection spreading to the optic nerve from a diseased sphenoidal sinus or posterior ethmoidal cell.

The uneventful recovery without operative interference is to be noted in view of the fact that some authorities regard facial paralysis in acute otitis media as a certain indication for operation.

[Many of the cases of facial paralysis with slight or no marked ear symptoms probably belong in this group. —Ed.]

Otitis Media Following Influenza. Ear infection from influenza is discussed by L. H. Lanier.[8]

Most ear infections from influenza do not give trouble until the symptoms of the influenza are abating and the patient is apparently recovering. This is usually in the

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(7) Glasgow Med. Jour., April, 1922.
(8) Eye, Ear, Nose and Throat Monthly, May, 1922.

second week when the vitality is lowest and the recuperative power is in abeyance. Whenever symptoms of mastoid disease occur in the early stage of influenza, it is probable that the ear disease antedates the attack of influenza, the latter disease having simply rekindled smoldering embers. It is not unusual when operating for mastoiditis, during an attack of influenza, to discover evidence that the disease has been going on for a long time. It takes time for pus to destroy bone and it is doubtful if bone necrosis can occur within two weeks after the cells have become infected.

In influenza, the various agents that ordinarily safeguard the integrity of the middle ear fail to function and the infection of the middle ear becomes an easy matter. The nose at all times harbors disease germs and these readily gain access to the tubes by such expiratory blasts as sneezing, crying, coughing, or even blowing the nose.

If for any reason the Eustachian tube—the drain pipe of the ear—fails to function, the accumulating exudate soon fills the various compartments comprising the middle ear, especially the mastoid cells, and presently by its pressure upon the drum head causes earache, than which no pain can be greater or more significant of danger. Often the blockage of the Eustachian tube is but temporary. This accounts for those mild attacks of earache which are controlled by rest, and the application of heat or cold, the symptoms passing away as soon as nasal drainage become re-established.

In infants, the onset of an ear infection is usually sudden, owing to the active secretion function. The middle ear fills rapidly. The child becomes feverish and fretful and declines food. It rubs the ear and refuses to lie upon it. There may be nausea, vomiting, and perhaps an irritating reflex cough. The infant whines rather than cries, because the latter act is more painful than the former. Accidentally touching the ear elicits a sharp outcry. When the pains become unbearable convulsions may occur and the child becomes unconscious.

Frequently symptoms of the middle-ear infection in a babe are so obscure and misleading that the attending physician is perplexed until the ear begins to discharge and discloses the seat of the trouble.

In adults, the earliest symptoms of an infected ear are throbbing and fullness in the ear. Presently there are head noises, dizziness and restlessness. Every movement of the head, and especially the jar of walking, increases the distress. Soon the hearing becomes dull and the feeling of discomfort merges into pain, which is worse at night and when lying down. Within a few days the symptoms of mastoiditis supervene and intensify the suffering.

A beginning earache should be treated with rest, fluid food, a saline laxative and the ice-bag. If the pain fails to subside after six hours, the drum head should be incised. In earache, as in appendicitis, prompt surgical measures are the most conservative ones that can be employed. Nothing is gained by waiting, as the danger and distress becomes hourly greater. To wait for a drum head to break, as is often done, is a grave error. It is a course which has been attended by much unnecessary suffering and many deaths. Pressure and pus are the basic factors in nearly all ear complaints and the sooner they are released the better.

Aside from waiting for the drum head to burst, the opening made by Nature is seldom all that can be desired from a surgical standpoint. It may be too small for adequate drainage; or, perhaps, it is too large or irregular and fails to close when the active discharge has ceased. Almost all the discharging ears that last through life can be traced to a spontaneous perforation.

Merely to puncture the drum head, as is done in paracentesis, is inadequate for the escape of thick fluid, and often fails to give relief. This operation has been discarded for the more thorough one for making a free incision under a general anesthetic. This incision should begin at the lowest part of the drum head, extend upward behind the malleus, and terminate in the swollen posterior canal wall.

Incision of the drum head is rarely followed by the escape of pus. Generally only a few drops of serum are released. After a few hours, however, the discharge becomes copious and purulent, and the patient is eased. Even physicians often wonder where all the secretion comes from, considering the small size of the middle ear.

As a matter of fact, the secreting surface of the entire middle ear has been computed to be larger than the palm of the hand. Usually the ear flows freely for a week. Then the discharge gardually abates and a week later it ceases entirely. Here again we note the merits of a clean incision, for as soon as the discharge stops the aperture in the drum head closes and the resulting scar in no way interferes with the functions of the membrane.

Normal hearing can be likened to a curved line, which rises from zero at birth, reaches its crest at the completion of adolescence, and drops to one-third in old age. If the curve be deflected by disease, the subsequent line becomes depressed and shows premature loss of hearing. The otitis of influenza is especially apt to alter the normal contour of the curve.

A running ear is one of the commonest and most troublesome aftermaths of influenza. Not only is the discharge discommoding but the condition is usually attended with poor hearing and head noises. The source of the discharge is an ulcerative lesion, either of the mucosa or of the bone. The longer the flow lasts the less amenable it becomes to treatment.

The difficulty often encountered in treating these cases is largely owing to the fact that the disease involves the attic, and is not easily reached. Generally, as soon as the tympanum has been cleared of foreign substances, the aperture in the drum head will close. The drum head possesses remarkable power in mending its defects with cicatrical tissue. Most holes in the drum head can be repaired if we will assist Nature by stimulating the reparative process, either by incising the edges of the perforation or by freshening the edges with acid. All perforations, about to close, become round, no matter what their former shape has been.

Ionization in Treatment of Suppurative Otitis Media. According to A. G. Wells,[9] this consists of passing a continuous current through Leduc's rheostat, the patient being placed in the circuit, and the positive pole (which can conveniently be made in the form of a vulcanite ear speculum containing a metal band which does not come into contact with the skin) placed in the ear which contains some of the ionizing fluid, while the negative pole is placed upon the patient's arm or leg. It is necessary to clean the ear thoroughly, and to remove all discharge, debris, etc., before attempting to ionize, otherwise failure is certain.

The ionizing fluid generally used is:

Zinc sulphate	5 g. m.
Glycerine	57 c. cm.
Water to	1000 c. cm.

Equal parts of this solution and hot water are employed. If, however, the ear is sore and painful and the mucous membrane swollen, salicylate of zinc may be used as the ionizing fluid, the negative pole being first used to produce the sedative effect of the salicyl ion, and then the positive pole to produce the action of the zinc ion on the tissues.

Ionization has been established, Wells says, as one of the most valuable and satisfactory means known for treatment of these cases. The method has at present definite limitations, but in the near future some of these may be curtailed.

The indications for ionization in this disease as observed by personal experience of some hundreds of cases permit the following groups to be described as unsuitable: (*a*) cases which present large granulations

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(9) Lancet, Dec. 17, 1921.

and polypi in the tympanum; (*b*) cases in which there is any disease of bone either of tympanum or mastoid; (*c*) cases in which the antrum is diseased; (*d*) cases in which there is disease of the Eustachian aube; (*e*) cases with any nasopharyngeal condition favoring re-infection of the ear; (*f*) cases in which the perforation in the membrane is so small that fluid can not pass satisfactorily from the meatus into the tympanum. With any qualifications applicable under these headings, it may be generally stated that cases suitable for ionizatoin are those in which the ionizing fluid can reach the whole area of suppuration.

It may be urged that most cases, if not all, of chronic middle-ear suppuration are not limited to disease of the tympanum, but that the antrum is also affected, and therefore ionization is not interfered with. The results obtained in various series of cases show a cure of the suppuration in percentages varying between 53 and 67, the whole averaging about 60 per cent. In some cases one ionization is sufficient, in others two and even three administrations are needed.

Besides being a valuable method of treatment, ionization is also, in many cases, an important aid to diagnosis. It frequently happens that in examining an ear, a little pus can be aspired from the antrum or aditus; it is hard to say definitely whether the antrum is too far diseased to hope for a cure by ionization, and whether indeed the proper treatment should not be a mastoid operation. Ionization frequently clears up this point; failure to effect a cure or any improvement justifies the assumption that disease of the antrum is sufficiently advanced to call for a mastoid operation.

THE MASTOID AND SINUSES.

Diagnosis of Acute Mastoid Disease. In discussing the diagnosis of acute mastoid disease J. M. Taylor[1] states that there is no sharp anatomic dividing line between the middle-ear cavity and the mastoid cells. To try to draw a fine line of demarcation between an acute otitis media and an acute mastoiditis is not only impractical and impossible, but also unnecessary. An *x*-ray plate of any acute purulent ear infection of several days' duration will demonstrate cloudiness of the mastoid cells indicating their involvement in the process and a certain amount of bony tenderness on pressure is often present in cases that we are accustomed to consider clinically as otitis media rather than mastoiditis. Suppuration in the mastoid often clears up spontaneously, just as it does in the middle-ear cavity.

So for practical purposes, instead of trying to draw fine distinctions in terminology, we may profitably take the viewpoint of the surgeon who is confronted with an acute suppuration in the temporal bone and try to lay down the principles which should guide him in its treatment, make clear the pathologic condition that is present, the structures that are involved or in danger of becoming so, and point out those symptoms and physical signs that should furnish the indications for operative intervention with a view to removing promptly the focus of suppuration, preserving intact the delicate structures within this bone and preventing the development of serious or fatal complications. The principles involved are the same that guide the surgeon in suppurative conditions of other bones of the body. Their application, however, is rendered somewhat obscure and a little difficult to appreciate by reason of the complicated anatomic structure of this little field.

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(1) Long Island Med. Jour., January, 1922.

An intact ear drum prevents the entrance of infection from the ear canal. We may omit from our consideration at the present time the comparatively rare instances in which there is a direct invasion by a blood-stream infection. The vast majority of infections involving the temporal bone originate in the nasopharynx and travel by direct continuity along the Eustachian tube to the middle ear. Such an infection causes congestion and swelling of the mucous membrane and an exudation of fibrin, serum and later of pus that can not drain out through the swollen, occluded tube, whose opening, by the way, is situated nearer the roof than the floor of the middle-ear cavity. This results in an accumulation of fluid that causes the ear drum to bulge outward and is accompanied by severe pain, deafness and tinnitus. The mucous membrane lining the middle-ear cavity is reflected over the ossicles, over which it is draped in folds. The congestion and swelling of these folds and the deposit of fibrin between them in the attic of the middle ear tends to limit the spread of infection. Under such favorable conditions, if prompt relief is afforded by the subsidence of the occluding swelling of the Eustachian tube, by the spontaneous rupture of the drum membrane or by its early incision and drainage by the surgeon, there is prompt resolution and return to normal in a few days, often within a few hours. While it may subside spontaneously and drain itself through the Eustachian tube, the application of sound surgical principles forces the conviction that, if there is a fluid exudate in the middle ear under tension, as evidenced by a bulging ear drum, the safest measure for preventing its further extension is prompt, free incision of the tympanic membrane. The patient is given the best chance to escape suppuration and its attendant evils when a means of escape for this inflammatory exudate has been provided.

The vast majority of ear infections are not seen by the otologist at this early stage when his surgical intervention can be most effective. His attention is most often called to them when they have passed the barriers mentioned and reached the attic of the middle ear. This space is directly continuous by a free opening with a comparatively large cavity in the temporal bone, called the antrum, into which open the ducts from each one of the many cells that fill the mastoid process and some other cells, too, that are in the squamous and petrous portions of the bone. When the infection has reached this point, it is probably true, as has been pointed out previously, that at least some of these cells participate in the infection. Such an infection differs from an osteomyelitis in other bones by reason of the fact that these cells are lined with a mucous membrane, just as are the accessory sinuses of the nose, a membrane that is capable of resisting and taking care of a certain amount of infection without being destroyed, and thereby protecting the bony structure underneath. If the infection is not too virulent and if the bony walls of these cells are thick and well supplied with blood vessels, a free incision in the tympanic membrane will drain the antrum and such accessory cells as are involved, as well as the middle-ear cavity.

There are certain indications for this operation in acute cases that are self-evident from a study of the pathology of this disease and that are well recognized and understood by all practitioners.

Symptoms indicating meningeal irritation, such as drowsiness, rapid pulse and high temperature, not accounted for by some infectious disease of which the otitis may be a complication, demand at once the best possible drainage that may be secured by this means.

Symptoms suggesting sinus thrombosis, chills and a temperature with wide excursions require not only a thorough mastoid operation, but also the uncovering and examination of the sigmoid sinus and often the removal of the thrombus and ligation of the jugular vein as well.

External abscess, associated with an acute ear infection, whether it points behind and around the pinna or spreads down into the neck is another positive indication for this operation. The fact that such an abscess may find its way to the surface through the thick cortex of the bone without causing severe pain nor constitutional symptoms is significant of the ease with which suppuration may equally well insidiously progress unobserved toward the cranial cavity.

It is not so well understood that it is not over the mastoid surface that signs of periostitis have from the first a serious significance. This is often first evident in the upper posterior wall of the bony meatus. The so-called sagging of the posterior upper wall is the result of periostitis in this region, which results from pus under pressure in the antrum. It is an extremely important indication to afford free external drainage by the mastoid route.

If facial paralysis occurs in the course of an acute otitis, it is an indication for immediate operation.

There is a group of fulminating cases of acute otitis, difficult to define exactly, in which there is a rapid spread of the infection to the mastoid cells, accompanied by high fever, extreme prostration, drowsiness and mental symptoms suggestive of serous meningitis. In cases of this type mastoid drainage is a logical procedure in the beginning, at the same time as the paracentesis or in place of it. In such cases it will mean the end of anxiety about the case and lead to rapid convalescence.

If it were not for the fact that the mucous lining along which these infections travel from the Eustachian tube to the furthest confines of the mastoid, is capable of resisting infection and preventing the involvement of the bone itself, we should at once attack surgically every suppurative inflammation of the temporal bone just as we do an osteomylitis of any other bone. We must bear in mind that the great majority of these infections, even with suppuration in the mastoid cells, resolve and make a complete recovery, provided satisfactory drainage is maintained through the tympanic membrane. It is in the cases in which this form of drainage is inefficient that we get prolonged suppuration, delayed convalescence and run the risks of permanent damage to the hearing function and the establishment of a chronic suppurating inflammation.

There are four symptoms that may persist if free incision of the ear drum is not successful in causing prompt amelioration of symptoms and disappearance of physical signs. These are rise of temperature, pain, bony tenderness on pressure and persistent, profuse discharge.

In regard to temperature and pain, it must be emphasized at the outset that extensive suppuration and destruction may proceed either rapidly or insidiously, while fever is absent and pain inconsiderable. When they are present they are of valuable diagnostic significance.

As regards fever, it must first of all be borne in mind that it may be caused by the original disease, of which the ear infection is a complication—measles, scarlet fever, diphtheria, influenza, pneumonia and the various other infections of which otitis media is a common incident. In the second place, we must consider the temperature as a possible evidence of some complication of the ear infection, such as meningitis and sinus thrombosis.

Pain, like high temperature, when it persists or reappears after rupture or incision of the drum, is indicative of retention or inflammatory products under tension and usually indicates involvement of the mastoid. Such pain is often different in type from that of the original earache, more deep-seated, knocking or boring in character, sometimes referred to as a headache. With severe pain of mastoid origin, insomnia also is an indication that resolution is not taking place. Temperature and pain are valuable clinical factors taken in connection with the other symptoms in arriving at a conclusion in regard to operative intervention.

Tenderness over the mastoid, without any other symptom of mastoiditis, is to be regarded as an indication for operation only when it occurs in the later stages of an acute otitis. In the beginning nearly every mastoid is more or less painful on pressure. But if tenderness, especially at the tip, occurs for the first time after the discharge has persisted for several days, it is then a sign of retention of pus and a progressive invasion of the mastoid which may demand operation.

A very profuse discharge, which rapidly refills the meatus as soon as it has been emptied, can not come from the tympanic cavity alone, and leads one to suspect a large pus-producing cavity in the mastoid. This condition may exist without rise of temperature, without external signs of mastoiditis and without the least tenderness on pressure, the only symptoms being the profuse discharge and impaired hearing. These are cases that are apt to run a long course, resulting in irreparable damage to the ear drum and the sound-conducting mechanism, with impairment of hearing, and are apt to be followed by a chronic ottorrhea. These are the cases in which it is difficult to decide whether complete healing will occur without operation. Most aural surgeons are agreed that mere persistence of a profuse purulent discharge is a definite indication for operation, and that while it persists there is a menace to life, health and hearing function.

It would seem that *x*-ray examination might be relied upon to furnish exact indications for the mastoid operation in suppurative inflammation of the temporal bone. Its use is of value, but only in conjunction with a consideration of the other clinical data. In the first place, nearly all cases of severe, acute otitis media show cloudiness of the mastoid cells, indicating their involvement in the process. The great majority of these promptly resolve and recover in a week or two. Radiograms, taken at intervals in the course of an acute otitis media, will demonstrate whether the infection is progressing or resolving, and are of value in this respect. They will also demonstrate whether the mastoid is composed of small cells with thick, well-nourished walls, or whether it is made up of large pneumatic cells with thin septa, in which progressive and rapid destruction may easily take place. In the later stages of the disease the *x*-ray will of course give evidence of the breaking down of the septa between the cells and the general disorganization of the bone. But it has already been demonstrated that in many cases it would be both unsafe and unwise to wait for such indications and that it would be wiser to be guided by the clinical signs and surgical principles we have discussed. If we relied upon the *x*-ray alone we would either operate unnecessarily because there was evidence of a cloudy mastoid, or we would operate too late while waiting for evidence of destruction of bone. In conjunction with the clinical evidence, radiography, however, is a valuable and helpful adjunct.

Indications for Opening Mastoid Cortex. The indications that justify removal of the mastoid cortex are given by F. P. Emerson[4] under three heads:

First: To remove a pyogenic focus threatening the life of the patient.

Second: To conserve hearing.

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(4) Boston Med. and Surg. Jour., March 9, 1922.

Third: To prevent a chronic mastoiditis.

In the presence of threatened complications all these indications may be present in one case or any one indication may lead us to decide that the best interests of the patient favor an immediate mastoid operation.

With an acute middle ear and mastoid involvement it may be said that operation is the safer alternative. In order, however, to obtain an early dry middle ear and good hearing it is necessary to choose a time for the operation when the bone abscess has commenced to be walled off by a leukocytic barrier, that is, has commenced to limit itself so that the involved area is definitely outlined and the infection has commenced to subside. In a series of twelve patients operated on by Emerson, in five cases the middle ear was dry on the fourth day, in one on the fifth, in one on the sixth, in one of the seventh and in four on the thirteenth to fifteenth day. While the type of infection, the resistance of the patient, and the question of re-infection must be considered as factors in delayed healing, yet the judgment of the operator as to when to operate, is the most important. We must remember that in all cases of virulent middle-ear infection the mastoid is involved, and to operate in the congestive stage means a prolonged middle-ear discharge and the danger that deeply placed cells may break down later. This is particularly true if the operation is done when the resistance of the patient is low, as is the case when mastoiditis complicates an infectious disease. The question of which mastoid to open when both sides are involved is often a serious problem for the most experienced otologist. In most cases of acute middle ears with mastoiditis we have as symptoms changes in the membrana propria, discharge, rise of temperature, tenderness over the antrum and tip with sagging of the posterior superior canal wall. How far can we depend on these symptoms as indications for operative interference? Are there any other symptoms of equal importance in making our decision?

Membrana Tympani: A nipple perforation with a firbrinous exudate in the middle ear or a so-called boggy membrane at the end of a week often indicates a low-grade process with a tendency to become chronic.

Temperature: The temperature is of no diagnostic significance, and rarely goes much over 102° F.

Posterior Superior Wall: Sagging of the posterior superior wall is perhaps the most constant and reliable symptom for operation in acute mastoiditis that we have. Even this symptom may be valueless owing to a circumscribed or diffuse external otitis. When the canal infiltration and a middle ear are associated, and particularly when the edema has extended to the mastoid cortex, the diagnosis may be very difficult.

Tenderness over Antrum and Tip of Mastoid: This is usually present during the first three days, and then as the periostitis subsides may entirely disappear. In itself it is not an indication for opening the cortex as it is present in practically all cases of acute congestion of the mastoid bone whether it is to undergo resolution or not. Another local symptom is of great importance, and is illustrated by the following case: A policeman was brought to the office with an acute ear. The drum was bulging, and there was extreme tenderness over the entire cortex. A free paracentesis was done under gas. The third day his physician telephoned that the discharge had stopped and the tenderness had all gone. He improved so that on the sixth day he was out of doors. On the seventh day he had extreme pain, and an immediate operation was done when the entire bony structure of the mastoid was found broken down. In this case, whatever the condition of the patient, there was one symptom that should have indicated danger and the need of an operation, and that was swelling back of the tip with tenderness over the emissary vein.

In Emerson's experience, when this comes on with the subsidence of the periostitis we can predict deep bone destruction as probably going on. The absence of pain after the third day is not unusual as the breaking down of the bony framework is not accompanied by pain unless a periostitis is present.

Discharge: The discharge after seven or eight days has two valuable diagnostic features. We say after seven or eight days, for the observation of Schwartze that few acute mastoids need to be opened until the eighth day after the onset of the middle ear trouble, with exceptions, still holds good. Then if the discharge is more than can be accounted for by the middle-ear condition, or if the serous discharge has become purulent, immediate operation is indicated. This is especially true if the patient is toxic.

Duration: After considering all the above indications for opening the cortex, we must also take into account the duration of the mastoid infection. Any case that does not show signs of improvement after ten days may justify operation to preserve hearing or prevent a chronic mastoidtis. Another danger in operating too early is that the original infection in the nasopharynx may not have quieted down and the middle ear may became re-infected. This was shown in a case of double mastoid operation where the patient did well for three day when there was a marked increase in the middle-ear discharge. On removal of the tonsils the discharge immediately quieted down, and there was a dry middle ear on the seventh day on both sides.

Night Pain: As the patient seems to be convalescing it is always a suspicious symptom to have a pain at night. This comes on after the patient has dropped to sleep, and may be only severe enough to awaken him. During the day it may be entirely absent and the patient may feel normal.

Leukocytosis: The white count is a help only, and may vary from 10,000 to 18,000, and is more an indication of the resistance of the patient. When there is a sudden increase to 25,000 or more, accompanied by a chill, it is a valuable indication of some complication, usually a sinus infection. The gradual recession is also indicative of a probable favorable termination. The polymorphonuclear neutrophiles are increased from 70 per cent to 85 per cent to 90 per cent, and a sudden drop to 70 per cent shows a loss of resistance. A high polymorphonuclear percentage indicates the severity of the infection.

Bacteriology: Type of infection: The *Streptococcus mucosus* and *S. pyogenes* or the *Pneumococcus* with the *Mircrococcus catarrhalis* are considered by Loeb and Beck to indicate strongly that an operation will be necessary. This is an indication only, for patients react differently to the same infection.

Type of Mastoid: The type of mastoid is to be considered. The pneumatic mastoid is more apt to undergo resolution with useful hearing, and the infantile type, in a general way, is more apt to become chronic.

The *x*-ray is a valuable aid to diagnosis if we remember its limitations, especially after the acute symptoms have subsided. It is very rare that we should consider operation on the *x*-ray picture alone. It needs the clinical picture to reinforce it and some one skilled in its interpretation.

A high temperature, associated with nausea and vomiting, convulsions or severe headaches, would indicate immediate operation if mastoiditis were present. In children these symptoms might come from an acute middle-ear infection alone; therefore, a free paracentesis may change the whole picture.

While the clinical picture of mastoiditis must be taken as a whole in forming an opinion for or against operation, yet the individual symptoms vary markedly in relative importance, and some are almost diagnostic of surgical mastoiditis alone. The one safeguard against mastoiditis as a complication of acute otitis media of supreme importance is early and free incision of the drum membrane.

In chronic cases, the indications for operation are: (1) continued suppuration resisting local treatment and accompanied by anemia and poor resistance of the patient; (2) chronic discharge with cholesteatome; (3) chronic mastoiditis with acute exacerbations in which the hearing is practically gone and treatment is unsuccessful; (4) chronic mastoiditis with facial paralysis, chronic unilateral headache, labyrinthine or meningeal irritation. All cases showing any labyrinthine reaction are included advisedly.

The local subjective symptoms in chronic mastoiditis may be entirely absent. There is a history of continuous or intermittent discharge. If intermittent during the acute exacerbation, the sagging of the posterior superior wall and possible tenderness back of the tip may be present. The subjective symptoms, however, in chronic cases, are not usually due to a periositis and acute bone congestion with toxemia, but to interference with drainage and pressure, hence the pain is usually referred to the head. Some times the milder symptoms, such as headache and occasional dizziness, have been endured by the patient for a long time until sudden vertigo, nausea, severe headaches, convulsions or symptoms of meningitis demand relief. When patients do apply earlier on account of tinnitus, foul discharge or loss of hearing, the seriousness of the case requires a careful neuro-otologic as well as middle-ear examination. More often these patients should be observed over some time before a definite conclusion can be reached. In the interval, all foci in the nasopharynx that might excite an acute exacerbation should be removed and the drainage from the middle ear promoted by incision and the removal of desquamating epithelium, pus and bone detritus. Following this treatment, if the discharge does not stop or there are symptoms of complications, a radical operation should be done. We must remember that all the symptoms of meningitis, including a bacteremia with virulent organisms in the spinal fluid, may be due to a complicating sinus infection, and prompt removal of the cortex and ligation of the jugular may save the life of the patient.

Headache as a Symptom of Mastoiditis. In writing of headache as a symptom of ear disease W. L. Culbert[5] states that he has observed more than a dozen cases of persistent headache associated with obscure and sometimes unsuspected ear disease, usually a mastoiditis. This is, of course, a trifling percentage out of the total number of cases of chronic latent mastoiditis seen by any aurist.

Conversely, among all the cases of periodic headache, there is a still smaller proportion which are due to chronic conditions of the mastoid. However, these cases, although infrequent, are serious—not only because of the severity of the headache, but because of the difficulty of diagnosis, and the gravity of the latent mastoiditis of which the headache is a symptom.

The mastoid conditions underlying these headaches may be: focal infection in the mastoid cells, or, chronic suppuration, or sclerosis, or necrosis of the bony wall of the middle-ear cavity and mastoid cells. Since it is possible for a diseased condition in the mastoid to be present for a long time with no subjective symptoms whatsoever, it is impossible to say why certain patients should present acute periodic headache as a symptom, while others do not.

Given this underlying condition of the ear, the recurring headaches may be still further precipitated by any disturbance of the circulation, by congestion from gastro-intestinal upsets, constipation, colds, fatigue, worry, a thousand different things, a fact which further confuses diagnosis when examination of the ear has been overlooked.

Headache is a general symptom. Cases of periodic

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(5) Med. Record, March 25, 1922.

acute headache come to all physicians, most frequently, probably, to the general practitioner. In making his examination, the physician takes into consideration the condition of the alimentary tract, the kidneys, the heart, the lungs. He may examine the stomach contents and the stools and find conditions that lead him to believe that improper functioning is the cause of the headaches. The blood chemistry may show want of proper elimination or implicate the kidneys. Again, if there is obvious eye-strain, the physician will turn the patient over to the occulist, or if there are repeated colds and pain in the frontal regions, he may suspect the sinuses.

The point to be emphasized is that when a patient complaining of headaches is examined, a complete history is not obtained unless the ear is considered. There need not be any active process present to demand consideration; the most innocent looking ear may harbor an underlying infection. Information should be elicited from the patient as to whether he ever had an earache or had the ear opened in childhood or even in infancy. This information is often hard to get; the trouble occurred so long ago that the patient has forgotten or never knew of it and may have to call on his family for information. Frequently the physician finds out that the ear was opened at some remote period and that there has never been any further trouble.

In cases presenting headaches as a symptom ears that have once been infected, no matter how long ago, must be suspected of being a possible focus of infection or of producing reflex pain through suppuration or sclerosis, particularly in those patients who show no other focus of infection and who do not respond readily to treatment directed at other conditions. Such patients to be treated fairly must have a functional examination of the ear by a competent aurist, and, equally important, an *x*-ray picture. If such examination reveals a chronic latent condition of the mastoid, proper treatment should be seriously considered while the mastoid is quiescent, without wating until it has the chance to become acute. There is no possible way of curing headache due to infection of the mastoid except by operation for the removal of that infection. In the author's very limited series of cases such operation has never failed to remove the headache along with its cause.

Suppurative Mastoiditis and Discharge from Ear. According to S. MacCuen Smith,[6] when there is a profuse discharge from the external auditory canal persisting, suppurative mastoiditis is almost assuredly present, as it is quite impossible for such a quantity of exudate to be secreted in the small tympanic cavity. This one symptom is indicative of suppurative mastoiditis even in the absence of other important symptoms, such as pain and a rise of temperature.

In children the cortex is usually thin and is readily perforated by carious erosion, causing relatively early tenderness and swelling over the process. Where the cortex is thick, however, the probabilities are that pain or perforation would occur very late, if at all; the inflammatory process, under such circumstances, would follow the line of least resistance and in all probability would be directed inward.

Drooping of the superior posterior osseous wall is an unfailing sign of mastoiditis that almost assuredly requires operation for its relief. This symptom is the result of an osteitis of the bony wall separating the external auditory canal from the mastoid antrum and the swelling of the soft parts lining the same. Should it happen that the disease is confined to the tip, there would not be this drooping of the osseous wall, but the condition might require operative intervention just as urgently.

A slight rise in temperature, perhaps not more than 99° F., is characteristic of mastoiditis, but if the discharge is not in any way obstructed it may not be

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(6) New York Med. Jour., Dec. 21, 1921.

above normal at any time, or may even be subnormal in the morning. It is not uncommon in children for the temperature to go as high as 105° or 106° F. during the very early stages. An infant suffering from ear disease will toss its head from side to side and show a tendency to put its hand up toward the affected ear. These are symptoms which should be remembered.

A good rule to follow and one that will often clear up a doubtful diagnosis is to examine the ears of the child in all cases in which a diagnosis has not been definitely made or can not be surely determined.

A type of mastoiditis which may be regarded as atypical is that in which the pus accumulating in the lower part of the mastoid again follows what seems to be the line of least resistance, burrows through the tip and is deposited in the tissues of the neck, causing a tumefaction below the mastoid, known as Bezold's variety of mastoiditis. Here again we may have a sudden cessation of discharge, or, in case the latter continues, the symptoms will be greatly ameliorated for the time being, when the pent up pus in the mastoid process finds its exit in the neck.

Still another variety of mastoiditis which may be obscure is that in which, notwithstanding that there is an ample discharge from the external auditory canal, the osseous structure of the tegmen antri and tegmen tympani undergoes necrotic changes, slowly or rapidly, through being exposed to the ravages of microörganisms, thus ushering the initial stage of a meningitis or brain abscess. The same process takes place when the erosion destroys the thin plate of bone separating the sigmoid sinus from the mastoid cavity, causing either a perisinus abscess or a sinus thrombosis. Some cases of meningitis develop very rapidly, resulting in death in an incredibly short time. On the other hand, the development may be very slow, the patient going about his usual pursuits at times until the disease is well advanced and recovery almost hopeless. The same is likewise true of sigmoid sinus involvement. Our efforts, therefore, must be directed toward a prompt recognition of tympanic disease and the relief of the same by free incision of the membrana tympani. Should the mastoid become seriously involved, it is much better to drain early through operative interference than to run the chance of an intracranial complication by delay.

As an aid in diagnosis the blood count is of great importance. A high leukocytosis indicates the patient's resistance to the disease. A high polymorphonuclear precentage represents the severity of the infection. It is evident, therefore, that if these maintain the same ratio toward each other, the protection of the leukocytosis is sufficient to counteract the destructive action of the polymorphonuclear element. If, on the other hand, the leukocytosis decreases and the polymorphonuclear percentage increases, the progress of the disease must be viewed with some gravity. Should the leuckocytosis remain high and the polymorphonuclear percentage decrease, we can record a favorable change. This indicates not only the diagnosis but the prognostic value of frequent blood examinations.

Roentgenography has proved a valuable aid in obscure cases, when the interpretation is given by an expert. The mechanical art of actually taking an *x*-ray photograph is perhaps not difficult to acquire, but the interpretation demands technique of a high order which can only be perfected by long study and extensive clinical experience, together with a proper knowledge of anatomy, pathology and the shadow values of *x*-ray plates. The position of the sinus can almost invariably be located and this alone is of the greatest assistance to the operator.

A Case of Microtia With Mastoid Involvement. This case, in a child of 20 months, is described by D. A. Cohoe.[7]

The external auditory canal was absent and the

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(7) Jour. Mich. State Med. Soc., May, 1922.

lobule and a rudimentary tragus were the only part of the external ear present.

The child had a negative history up to five weeks previous. She had recently had an attack of scarlet fever associated with an acute abscess of the left middle ear with its usual rupture of the tympanic membrane and its flow of pus which ceased after about ten days. The left ear was normal in every way when Cohoe examined her.

There was a circumscribed area over the right mastoid bone, about the size of a 25-cent piece, which was red and elevated and also fluctuating.

The usual incision was made as accurately as possible and a large amount of pus was evacuated. The outer wall of the mastoid bone was fairly thick and the antrum was filled with granuloma and some pus. The cavity was easily curretted and the antrum was easily probed. The posterior wall of the bony canal was very sloping and there was no marked ridge. An incision was made over the depression which was most marked by finger pressure and the knife was extended deeply into the tissues to determine the presence of a tympanic membrane. Dense tissues were encountered, rather fibrous in character and no tympanic membrane was found.

The mastoid cavity was very deep and the anesthetist was instructed to watch for facial twitchings.

The wound was packed as usual with iodoform strip and at the end of thirty-six hours there was a marked facial paralysis of the right side. The packing was removed immediately, but the paralysis continued for three weeks and then disappeared entirely.

Radical Operation for Chronic Purulent Otitis Media. This is a much rarer condition today than it was ten or fifteen years ago, says J. H. Foster.[8]. Then a large percentage of ear patients applying for treatment were afflicted with a chronic discharge, while today the pro-

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(8) Southern Med. Jour., January, 1922.

portion is relatively small. There is no stronger evidence of the value of the early care of acute otitis media and attention to the causes predisposing to it than is seen in the gradual and, we might say rapid, diminution in the number of chronic cases encountered. No acute case should be allowed to become chronic and unquestionably under ideal conditions the necessity for the radical operation should become insignificant.

Nor can it be denied that many chronic cases now yield to conservative methods that were formerly subjected to the radical operation. Unquestionably, thousands of radical operations were done on patients who could have been relieved by conservative means, and when the first flush of enthusiasm for a new procedure had subsided, men settled down to a saner consideration of the subject with the result that they became slower to advice a radical procedure before making a thorough attempt to effect a cure by other means. Most of us have seen cases that at first seemed hopeless from a conservative standpoint yield to such means as the removal of polyps or adenoids, careful and systematic cleansing, the use of suction, vaccines, etc. In other patients who did not respond to these measures a simple mastoid operation, or the so-called "Heath operation," avoiding some of the dangers of the radical procedure, has sufficed to bring about cure with good hearing where this has not already been seriously affected.

But after eliminating these cases that we have found will yield to conservative treatment, there remains a not inconsiderable number of patients with a persistent discharge of fetid odor, some with headaches and dizziness, some without. In these the radical operation is indicated and should be done with the assurance of a good result.

Recurrence of discharge is observed among every aurist's cases at times, even after thorough healing. As a rule, these fall into two classes:

1. Those in which infection comes up from the nose

and throat through a patent Eustachian tube. This is an acute infection and can be treated as such with prompt subsidence. Attention to the nose and throat is as necessary in these cases as in any other acute ear infection.

2. Those patients who come back with a foul discharge and more or less of the cavity raw and granulating where it had previously been covered with good epithelium. These cases are due to the rapid exfoliation of the new and poorly nourished epithelium covering the bone. If a patient be seen from time to time for two or more years following the operation and the ear cleaned out this condition can, as a rule, be avoided. When it does occur it may take some little time to get it dry and secure re-epidermization, but the condition is never so grave as the moment of discharge and the odor would lead one to believe at first. Of course, if remains of cholesteatoma are present, only removal of that will effect a cure.

Re-infection through the Eustachian tube leads naturally to the consideration of the question of attempting to close the tube at the operation. There is considerable diversity of opinion on this subject. Formerly practically all operators made an effort to cause the tube to close and were successful in a certain percentage of cases. Now many men do not touch the tube.

[Another common cause for recurrence of discharge is failure of the operator to secure a large enough flap and external auditory meatus. When these are too small the exfoliated layers of epidermis remain in the cavity and in time cause irritation and discharge.—Ed.]

The Mastoid Operation Under Local Anesthesia. This is described by E. E. Koebbe.[9]

The pre-operative preparation of the patient consists of shaving the part as usual. The meal previous to the operation is omitted and a simple enema may be given. One-half hour before the operation, ¼ grain

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(9) Jour. Amer. Med. Ass'n., May 4, 1922.

of morphine and $^1/_{150}$ grain of atropine are given. The patient is not taken to the operating room until all preparations for the operation have been completed and the operator and his assistants are ready to begin the operation. The patient is placed in a comfortable position on the operating table. This requires careful attention, as the comfort of the patient is very important. The field is prepared in the usual manner. As in all work with local anesthesia, the mental attitude of the patient plays a great part. Prior to the operation the words "mastoid" and "operation" are avoided; an expression such as "open the bone" or "get out the pus" is used. During the operation it is advantageous for the operator to carry on a conversation with the patient having no bearing on the operation.

For all of the cases, 1 per cent procaine with from 1 to 2 drams of 1:1,000 epinephrine solution to the ounce has been used. The procaine and epinephrine are boiled separately. An ordinary 2-c.c. Luer syringe with a No. 23 gage 1-inch needle has been used. The subcutaneous tissues are first infiltrated, beginning at a point directly posterior to the external auditory meatus in the line of incision and following the line of incision to its most upper and anterior point, and then downward anterior to the pinna as far as the level of the tragus. The next infiltration begins at the same point as the first, and extends downward to about 1 inch below the mastoid tip. At this point a slightly deeper injection is made; this effectively blocks the great auricular nerve. Directly below the mastoid tip a deeper injection is now made; this blocks the posterior auricular nerve. The branches of the small occipital nerve are now blocked about 1½ inches posterior to and on a level with the external auditory canal, nearly to the attachment of the tympanic membrane. This step is very important, as the patient will experience pain when the periosteum around the canal is elevated, and the pinna is pushed forward if this injection is not made. Finally, the needle is thrust under the periosteum in four or five places so that the anesthetic completely infiltrates all the periosteum that is to be elevated. All this is done before the skin incision is made, and it is not necessary to use any more anesthetic after the operation has begun.

It requires from 6 to 8 c.c. of solution to complete the anesthesia. As soon as the last injection has been made, skin clamps are used to hold the mastoid sheet and towels in position. It is not necessary to wait after the injection has been finished before the incision is made.

The technique of the operation differs in no way from the same operation under a general anesthetic. After making the incision through the skin, periosteum and intervening structures, the operator is happily surprised to find an almost bloodless field. Occasionally it may be necessary to clamp one or two of the larger vessels with hemostatic forceps; but after the self-retaining retractors are placed in position, the field is practically bloodless. In this series of cases, an electrically driven bone drill has been used almost exclusively to make the first opening in the bone. After that, rongeur forceps and bone curettes are used in the usual way. If it is desired to uncover the lateral sinus, this can be done painlessly without any further use of anesthetic. In cases in which there is an extradural abscess, the inner table of bone can be removed as necessary.

Experiences Mastoid Operations Under Local Anesthesia. These operations have been performed for several years by H. B. Graham.[1]

The technique is simple, as there is no sensation in the bone, the skin and periosteum alone are desensitized. The customary ¼ gr. morphine and $^1/_{150}$ gr. atropine having been given a half hour before the operation, a skin and periosteum infiltration of 2 per cent

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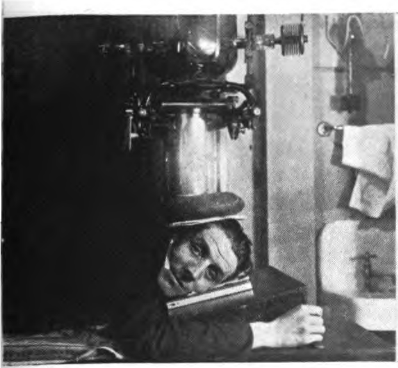
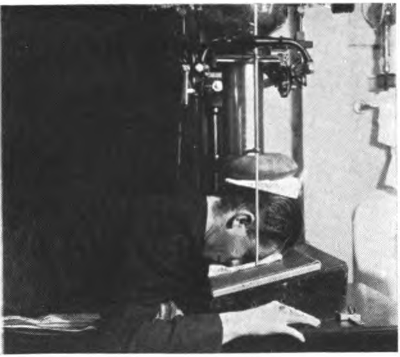
(1) California State Jour. Med., April, 1922.

PLATE XXV.



Position of Dixon "pillow," patient and tube in roentgenographing left mastoid region.



Dixon "pillow" as used by the author in roentgenographing the nasal accessory sinuses.—Holding, page 294.

novacaine solution is made, particular attention being paid to the external canal. The operation is then completed as usually performed, a sharp chisel being used and small, thin chips being removed with each blow of the hammer.

About two years ago Graham performed a radical mastoid exenteration by this method in a case of tuberculosis of the lungs in which it was unwise to give a general anesthesia, the bridge and small bones being removed under local anesthesia and gas used for the middle-ear curettement and the plastic work.

Since then he has done similar operations in two other tuberculous patients. These operations have been very satisfactory and the patients have been so much improved in their general condition that one was led to suspect that the ear condition was responsible for the former lack of improvement. One patient showed a quiescent lung condition but was coughing considerably and running a temperature of 99° F. After the operation, the cough completely disappeared and the temperature remained normal, the patient being discharged in four weeks completely cured in respect to his ear and with arrested lung symptoms.

Another patient has shown marked improvement in the temperature and pulse chart and has lost an annoying cough.

That there are cases in which the local anesthetic is the one of choice is without question. Kidney and lung lesions may be conserved by this method, and it is a question whether it would not be advisable to employ it in the majority of adult cases.

The operations under local are slightly longer than under ether anesthesia, as the chiseling must be done more cautiously, but none of these took more than one hour, and one was done in thirty minutes; so the patient is not under a very severe strain mentally or physically. As a rule a brisk conversation is conducted with the patient during the operation to distract his attention from his troubles.

Technique of Blood-Clot Operation. In considering the technique of the blood clot method in mastoid operations G. O. Sharrett[2] gives a number of essentials and describes his method of operating:

First, it is necessary to do a complete antrotomy and exenteration of the mastoid cells, removing all diseased cells, including those in the root of the zygoma and the mastoid tip. Cells overlooked in either place will be responsible for a continuation of the suppurating process and will cause delayed healing, extension of convalescence and deformity.

Next, there should be a wide opening in the tympanic membrane, a myringotomy and not a paracentesis. We all know that at the present time numerous cases of mastoid suppuration might have been avoided had a good myringotomy been performed at the proper time. Therefore, it is very important that at the time of operation the tympanic membrane should be inspected and proper drainage assured.

The third consideration, and most difficult, is the part of the technique which has produced the most discussion of the blood-clot method of operation; that is, to reduce any over-looked infection to such a minimum that the blood flowing into the wound will be able to take care of what remains and the wound will remain free from suppuration.

The question which then arises is: Shall we use an antiseptic solution in our wound? All kinds of solutions have been used in the mastoid wound—alcohol, iodine, bichloride of mercury, Dakin solution, etc.—and both good and bad results have been reported following their use. In Sharret's cases he has used only normal saline solution and his results have been most satisfactory. For some time he has discontinued the use of any other solution.

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(2) Southern Med. Jour., November, 1921.

Therefore, the technique of the ideal mastoid operation is as follows: Make an incision posterior to the ear extending from the tip to a point a quarter of an inch above the roof of the external auditory canal. If possible, avoid incising the temporal muscle. Go through the skin and periosteum to the bone, cutting the attachment of the fibers of the sternocleidomastoid muscle from the external surface of the mastoid tip so as to leave no loose fibers in the wound. Then open the mastoid antrum, removing the cortex of the mastoid, and completely clean out all affected cells in the mastoid process. Examine the tympanic membrane to be sure that there is a sufficient opening for drainage through the external auditory canal. Pack the posterior wound with sterile gauze. Then, with an irrigator containing normal saline solution, flush out the external auditory canal. Remove tip from the irrigator and with the tube remaining, after having removed the packing from the mastoid wound, flush the posterior wound with normal saline solution, retractors and hemostats having been removed. Allow the wound to fill up with blood and close tightly with silk sutures. Cover the whole with a sterile gauze dressing. This, of course, must all be carried out under the most rigid aseptic precaution. An iodoform drain should then be placed in the external auditory canal. At the end of forty-eight hours this dressing should be removed and the wound inspected. On the fourth day, when the second dressing takes place, every other suture should be removed and on the sixth day all sutures should be out. At each dressing which should be carried out under strict aseptic precautions, so that no infection from the outside may take place, the drain in the external auditory canal should be removed. Usually at the time of the third dressing, or on the sixth day, the external auditory canal is dry and the discharge from the middle ear has ceased.

If the wound shows signs of breaking down it is very easy to place a gauze wick from the lower portion of the wound into the mastoid antrum. This will give excellent drainage and usually in a few days the middle ear is dry and the posterior wound heals without any trouble, although there is not a typical primary union.

The essential to successful mastoid surgery is to follow diseased tissue no matter where it leads. The surgeon who is unable to do this should not operate, because he will probably leave necrotic tissue behind to cause trouble later. It is not a crime nor is it extremely dangerous to uncover the lateral sinus or dura in the mastoid operation if necessary, provided the opening over the sinus and dura is made of sufficient size.

In the suppurative mastoiditis, in which we have a complete destruction of all cells and the mastoid cavity filled with free pus, it is easy to obtain a primary closure with the technique described. But in the hemorrhagic stage of mastoiditis, before pus has actually formed, it is necessary to be even more careful in the course of the surgical procedure to remove completely all infected cells.

Modern Methods in the Dressing and After-Care of Mastoid Operations. This subject is discussed by H. B. Blackwell.[3]

So great has been our progress along these lines that to-day one may fairly say that the time required for the healing of a mastoid wound is usually less than half of the period formerly considered necessary. At present the dressings are comparatively painless and now instead of healing taking place with an unsightly hole behind the auricle the mastoid scar more frequently resembles an ordinary incision with little or no depression.

The influences which have brought about this happy change of convalescence in the mastoid patient are many, but from a technical standpoint Blackwell believes they can be grouped under the following heads:

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(3) Med. Record, April 22, 1922.

1. The general dissemination of knowledge concerning the technique of the simple mastoid operation, with a resulting improvement in operative skill shown by specialists generally.

2. A complete change of attitude as regards the use of gauze in postoperative dressings. Formerly this agent was employed in a mastoid wound not so much for drainage as for the production of pressure, which for some inscrutable reason was considered necessary in the wound. In the old days, immediately upon the conclusion of the operation the mastoid cavity was packed tightly with gauze, the final strip was frequently forced into the wound by the operator leaning with his weight against the dressing. It was not uncommon to employ five or six strips of gauze one inch wide. A dry external dressing was then usually applied and the first complete dressing performed on the fourth or fifth day. This tight packing and mass of external dry gauze acted as an excellent cork, frequently damming retained wound secretions. So great was the pain attendant upon the first dressing that it was commonly considered necessary to give a general anesthetic.

Operators generally use today less than one-half the quantity of gauze in the mastoid wound than was formerly the case. We have learned that when a thorough mastoidectomy has been performed it is no longer necessary to pack the wound tightly, as the disease processes have been removed now, generally speaking, by the operation.

3. The use of more sutures at the conclusion of the operation; now it is customary to suture the upper half of the wound only, the lower half or one-third being left open.

4. A much more tolerant and sympathetic attitude is held today toward the development and growth of granulations in the mastoid wound. The former practice of scraping, excising, and cauterizing these loops of blood-vessels is no longer practiced with the same

religious fervor; they are even frequently permitted to become redundant, and some of us hold that the wound when clean may be permitted to heal from above downward, below upward, behind forward, or without inward with perfect safety. Since our operative skill has improved and we have become more thorough in removing these diseased mastoid cells our postoperative dressings have become simpler and infected wounds have become infrequent. During the era of tight packing, owing to the great pressure exerted by the gauze, the inside of the mastoid cavity often presented a hard white appearance resembling a tea cup with no evidence of granulation tissue for a period of sometimes two weeks or more after the operation. In some cases in which a more thorough operation was performed, if tight packing especially in the antrum region had been continued the mucous membrane of the middle ear grew out into the mastoid wound resulting in a deep post-aural depression with a permanent fistula at the bottom; or it would form an air sack at the bottom of the wound underneath a thin cicatrix which would balloon out upon forcibly blowing the nose or tend to break down at future intervals.

5. Wet and frequent dressings: This subject really comes under the head of improved drainage as the latter is best promoted by the application of these principles. Mastoids are today dressed more frequently than heretofore. The author believes in dressing mastoids every day, and for the first ten days or two weeks he employs an external wet dressing as the moist gauze seems to absorb discharge more readily.

Advantage of Using Dixon's Thirteen-Degree Angle in Making X-Ray Plates of the Mastoid Accessory Sinuses. This is discussed by A. F. Holding.[4] In addition to the usual technique the following details should be observed:

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(4) Jour. Radiol., January, 1922.

1. Lead kits with round windows just large enough to include the mastoid area are used on top of the plates.
2. These plates are placed on top of the 13° angle wooden pillow.
3. The pinna of each ear is held forward by adhesive plaster.
4. Both mastoids are *x*-rayed on the same plate so that the posterior portions of the mastoid cells are in juxtaposition for easy comparison; that is, the shadow of the left mastoid is on the right end of the plate and the shadow of the right mastoid is on the left end.
5. When making the left mastoid exposure the patient has the right hand above the head and the left hand at the side; when making the right mastoid, this position is reversed. This seemingly trivial detail is very important in order to have the shadows of the external and internal auditory meatuses superimposed.
6. After exposure a lead-and-copper disc is accurately centered over the area on which the *x*-rays have acted; the usual lead numbers and letters are laid on the plate for orientation and for identification, and exposure made in order to cut a background on the plate to aid the eye in studying the details of the shadows (Plate XXV).

Sinus Infection a Common Complication of Middle-Ear Disease. According to J. P. I. Harty,[5] infection of the venous sinuses is one of the commonest of the intracranial complications of suppurative middle-ear disease. Most frequently it is associated with the chronic form of suppurative otitis media, but it also occurs in the acute form, especially in young subjects.

The tendency from reading text-books is to regard inflammation of the mastoid bone as an entity; this is erroneous, as it conforms to inflammation of bone in other regions. In suppurative otitis media we really have a muco-periostitis, markedly so when the mastoid

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(5) Bristol Medico-Chirug. Jour., September, 1921.

antrum, aditus and cells are involved, which, though not universal, is a very frequent occurrence. Once the inflammation has penetrated beyond the muco-periosteal limits an acute osteomyelitis occurs, and to this condition the name of mastoiditis is usually applied. The terminology of acute and chronic mastoiditis is very confusing, as osteomyelitis may occur, either with an acute or a chronic suppurative otitis media, and especially so as the osteomyelitis does not necessarily involve the mastoid process alone, but may attack other portions of the petro-mastoid, either in combination with or apart from the mastoid process.

Infection of the venous system is very prone to occur in acute inflmamation of bone, owing to the large size of the venous radicles and the practical absence of capillaries, while this liability is further increased in the petro-mastoid owing to the very short course of these radicles before entering a large venous sinus. An important point to remember is that while otitis media—the determining factor of the mastoiditis—may subside, the mastoiditis may progress. So suppuration in the mastoid process, with its accompanying complications, can exist with an intact tympanic membrane and no otorrhea.

A healthy sigmoid sinus may lie above a phlebitis, or even thrombosis of the jugular bulb. Aspiration with a hypodermic syringe only further deludes, and at the same time is always a risky procedure, as cases of infection from wounds of the sinus undoubtedly occur. The fact that general systemic infection can occur through a phlebitis or thrombosis of one or more of the mastoid venules, apart from sinus infection, is a point to be remembered. This explains the subsidence of symptoms which occurs after operation in those cases in which the mastoid cells and antrum have been opened, and the sinus exposed, without even the definite exhibition of pus.

The following are the usual routes of infection:

1. The most usual is by direct extension. This is favored by a pneumatic or diploëtic mastoid process, or by a combination of these two types. During operation on these patients the sinus is exposed after the removal of a few flakes of bone, and is very often surrounded by a peri-sinus abscess.

2. Through the venous radicles from the mastoid cells opening into the sigmoid sinus: It is in this type that intervening bone, of a more or less healthy appearance and varying thickness, is encountered between the pus-containing mastoid cells and the sinus. It is the author's experience that a smooth layer of ivory-like bone overlying a sinus always indicates a perisinus abscess with a thrombosed sinus.

3. From the superior petrosal sinus: No instance of this is recorded in these notes.

4. Through the floor of the tympanum to the jugular bulb, especially in acute suppurative otitis media and in children, in whom a dehiscence of the bone may be present.

Symptoms and clinical signs: 1. High temperature, 102° to 106° F., in a case of suppurative otitis media, either acute or chronic, is always suggestive of sinus implications. If there is any history of a definite rigor it is, in a large percentage of cases, pathognomonic. In typical cases the temperature falls to normal, accompanied by profuse perspiration, and two or three of such rigors may occur in severe infections within the twenty-four hours; while in a fair number of cases rigors may be so slight as to have been overlooked. The pulse-rate is proportionately accelerated to the temperature unless further intracranial complications exist.

2. Otorrhea of either the acute or chronic variety: If this is absent, the history of a discharge which has lately subsided, or a recent earache, should be elicited.

3. Deep-seated pain in the mastoid region.

4. Mastoid tenderness is usually, but not invariably, present, and may be associated with overlying edema,

which is particularly marked when thrombosis has extended to the mastoid emissary vein.

5. The mental condition is not altered in the uncomplicated cases.

The following additional symptoms are occasionally seen:

6. Tenderness over the course of the upper part of the internal jugular vein and associated swelling of this region of the neck may be present if phlebitis or thrombosis have extended to the vein, and therefore is rather a late symptom, and should in no way be regarded as pathognomonic. Torticollis in association with this has been observed.

7. Optic neuritis is present in a small percentage of cases.

8. Vomiting may occur.

9. The 9th, 10th, and 11th cranial nerves may be implicated from thrombosis of the anterior condyloid vein.

Preparation of X-Ray Plates of Mastoid for Lantern Use. A new method of preparing *x*-ray plates of the mastoid for lantern slide projective is proposed by Norval H. Pierce.[7] To overcome the difficulty and expense of copying plates one may simply place a lantern slide cover plate over the desired portion of the film and cut it out. This portion of the film is then placed between two cover plates, and the edges are fastened with passe-partout. The slide is now ready for projection, and will appear on the screen as it does on the film as regards black and white, without loss of detail.

For roentgenograms taken on sensitized glass plates, a diamond glass-cutter may be used to cut out the desired portion. A cover glass is then placed over the photographic surface and the two bound together as before.

This is also a convenient and practical method of preserving the pictures of the mastoid, since both right and left mastoids may be placed on one plate.

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(7) Jour. Amer. Med. Ass'n, May 20, 1922.

Lesion of Otolith Apparatus. A case of disease or injury of the otolith apparatus of the internal ear is reported by Robert J. Hunter.[8]

The patient, a boy 2 years old, was struck in the head and for twelve years afterward had continued to hold his head in a peculiar position. The patient presented as his most prominent physical sign a marked horizontal nystagmus, with excursions varying greatly. The nystagmus was horizontal when the head was held with the horizontal semicircular canals parallel to the floor. In this position, with a pencil held at or near his near point, the movement was so small and fine that it was difficult to describe its direction. When asked to look to the right, he had horizontal nystagmus to the right, which was quick and of small amplitude. When asked to look to the left, he had horizontal nystagmus to the left. That is to say, the quick component was to the left on looking to the left, and to the right on looking to the right. The amplitude was greater, but the frequency was less, when he looked to the left. When asked to look to a distant point, he had marked horizontal nystagmus, which was very quick, of good amplitude and with the quick component to the left. The patient stated that when he looked at an object close at hand he had noted that the violent movement stopped. He had also noted that, if he put his head to the left side about 15 degrees, the nystagmus stopped. When he held his head straight or looked at a distance, he became dizzy and "sick at the stomach." He defined dizziness as a state in which objects moved back and forth. He said that the room did not go round. When he looked up, the nystagmus continued to be horizontal and to the left. When he looked down, the nystagmus was very slight. When he read a book, the nystagmus was very slight, if he held his head to one

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(8) Jour. Amer. Med. Ass'n., May 6, 1922.

side. He did not have these attacks when in bed. He had not noticed what effect shutting the eyes would have. With eyelids gently closed and the head 30 degrees forward, both eyes appeared to be turned inward and slightly upward. When the eyelids were raised during forcible closure, the eyes were looking straight ahead, and then turned upward and outward.

The position of the head which the patient found most comfortable was with it inclined to the left shoulder and with a line from the external auditory canal to the external canthus, 30 degrees upward, that is, the head upright and the right chin rotated 10 degrees to the left. When told to look at a distance with the head in this position the eyes oscillated very slowly and slightly, it was impossible to say in which direction. He still showed some nystagmus on looking to the right, and to the left on looking to the left with the head held in this position. With his head 60 degrees back, he held his eyes still for several seconds, when they oscillated again. With his head either over to the left or over to the right shoulder, he could hold the eyes almost still. With his head 30 degrees forward he had spontaneous past-pointing when taken in the perpendicular plane of 2 inches to the left with the right arm, and 3 inches to the right with the left arm. With his head in the same position, the past-pointing in the horizontal plane gave 2 inches below with the right arm and touched with the left arm. With his head 60 degrees backward he touched normally when moving the arms in the perpendicular plane, and the same when moving the arms in a horizontal plane. With his right leg (when the head was 30 degrees forward) he spontaneously past-pointed to the right. With the left leg he touched normally. When the head was 60 degrees backward he touched with both feet.

With the head held in the patient's "favorite position," he past-pointed normally, with his arms moving in the perpendicular plane, and also with his arms moving in a horizontal plane. With the right leg he was a little uncertain in pointing, going sometimes to the right and sometimes to the left. With the left leg he touched.

Station was perfect. Gait was normal. Gait was normal walking to an object 15 feet away with the eyes shut. When his head was held 30 degrees forward, the eyes being shut, he walked to the right sometimes, and sometimes he touched.

Several teeth were decayed. Both ear drums were retracted. There was an old scar in the posterior quadrant of the right side. Hearing was normal.

Caloric test of the right ear, with water at 68 F., revealed rotary nystagmus, small amplitude in forty-five seconds. Horizontal nystagmus, was marked. Past-pointing was normal for all pathways. Caloric test of the left ear, with water at 68° F., revealed rotary nystagmus, small amplitude in forty-five seconds. Horizontal nystagmus was marked. Past-pointing was normal for all pathways. Caloric test of the left ear, with water at 68° F., revealed rotary nystagmus, small amplitude in forty-five seconds. Horizontal nystagmus was marked. Past-pointing was normal for all pathways. There were marked nausea and vertigo with each ear.

The rotation test was made one week after the caloric test. Rotation, ten turns to the right in twenty seconds, gave horizontal nystagmus to the left with marked excursions. This nystagmus would keep up indefinitely, but Hunter is sure, from the change in rapidity and amplitude, that he got a stimulus through. There was marked sense of vertigo.

Rotation ten times to the left in twenty seconds gave nystagmus to the right. The amplitude was small. The excursions were rapid. After thirty seconds the nystagmus reversed and became the usual constant type seen in the patient. Just as the nystagmus reversed, the patient said, "The objects are not moving," and as the usual constant nystagmus started again he said, "There they start again." There is no question that he got a stimulus through. Vertigo was marked.

Rotation ten times to the right in ten seconds gave past-pointing to the right with the right arm 1 inch two times, and past-pointing to the right with the left arm 2 inches three times. There was marked nausea.

Rotation ten times to the left in ten seconds gave very marked nausea; the patient was distracted. He touched with the right arm and past-pointed to the left with the left arm 1 inch.

After a short rest this test was repeated, and he past-pointed 3 inches to the left with the right arm, and touched with the left arm. The patient vomited.

The rotation tests disclosed that impulses went through all pathways and were of usual intensity.

The patient consulted the eye dispensary of the Lankenau Hospital, Dec. 14, 1921, for the relief of asthenopic symptoms. He had never worn glasses. Examination by Dr. A. C. Sautter disclosed a lateral nystagmus which, the patient stated, had existed since birth. This nystagmus was most pronounced while fixing a distant object. With his head turned to the left, nystagmus was much less marked, and vision tested with the head in this position equaled 6/6 in each eye. Direct vision in each eye equaled 6/30 of the normal. Ocular excursions were full in all directions, and accommodation and convergence were normal. The corneas were clear, pupils 4 mm., irises reacting normally. Ophthalmoscopic examination revealed in each eye clear media and healthy eyegrounds. The refraction was taken with the aid of scopolamine, but no lens improved vision; consequently, no glasses were prescribed.

The interesting points in this case are: (1) the history of incidence of nystagmus after a blow; (2) the significant fact that this had continued twelve years, and that except in his "favorite position" the nystagmus was constant and that there had been no vicarious assumption of function, such as we find after injury to the semicircular canals; (3) the most interesting feature, that the nystagmus was almost entirely absent in his "favorite position," but resumed instantly as soon as the head was moved from this plane, no matter how slowly and carefully it was moved, and at the same time the past-pointing, which was normal in his "favorite position," became abnormal in other positions. This points, probably, toward an injury of the otolith apparatus which was probably on the right side; the left side, maintaining tonus, caused the head to be drawn to the left. It is probable that this posture, according to the theory of Magnus and de Kleijn, places the otoliths in a position of pressing on the maculae, and therefore gives a minimum stimulus. As the otolith organ on the opposite side is non-functioning, we have the normal opposing muscle tonus of the neck muscles removed; and the head took that position when at rest.

Perception Deafness. In discussing perception deafness F. P. Emerson[9] says of the etiology of non-suppurative deafness that there have been two theories that have divided otologists into camps. First, those who have believed in the theory of negative pressure, and second, those who have believed in infection as the primary cause. Of late years the advocates of infection have been the more numerous. Judging from the treatment generally accepted by otologists, it is fair to assume that the second class have believed that deafness was the result of an acute infection that damaged the conduction apparatus and then ceased to be a factor in the further progress of the disease. The deafness was then progressive by further attacks of tubotympanic catarrh that was the result of a fresh infection. The writer takes issue with this position and claims that all deafness is the result of a deep infection in the

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(9) Ann. Otol., Rhinol. and Laryngol., December, 1921.

lymphoid tissue; that the infection then exists as a chronic focus subject to acute exacerbations; that the resulting deafness does not occur from the extension by continuity of the infected tissue through the tubes and middle ear so much as it is the result of a toxin acting on the perception apparatus. That is, we have perception deafness from the beginning that can be demonstrated throughout its course until the end-result, which is either nerve degeneration or perception deafness, without regard to the tissue reaction in the middle ear.

If we carefully analyze our histories of chronic deafness we find in one class that there was otalgia in childhood, and in these cases we all attribute the middle-ear involvement to a blocked tube secondary to infection of the lymphoid tissue. Until adolescence, lymphoid tissue predominates and beyond this period it is replaced by fibrous and mucoid elements. With the change in structure the lymphoid tissue undergoes retrograde changes, becomes less functionally active, and is therefore more susceptible to infection. The next class of cases follow the infectious diseases and are characterized by a more virulent infection which, in many instances, results in chronic foci subject to acute exacerbations throughout life. For a long time the foci may remain as a walled-off local process. If the resistance of the host is lowered, the virulence of the organism increased or necrotic tissue changes destroy the leukocytic barrier, then we have systemic complications with remote tissue reactions. Why this takes place in a particular joint, endocardium or middle ear, we do not know, but once having occurred the tissue reactions go on in the same organs indefinitely. The history clearly shows that the patient was never deaf until a certain time when he had influenza, measles, diphtheria, etc. Following this infection the deafness was progressive, and especially noticeable after acute exacerbations. Cultures of the throat show some form of virulent bacteria present in the lymphoid tissue. The vessels of the anterior pillars are injected, the tonsillar crypts contain pus, mucopus or debris. The secretions of the pharynx are changed—*i. e.*, there is a low grade pharyngitis, and the deep cervical glands under the angle of the jaw are enlarged. With acute exacerbations of the focal process these glands are sensitive on palpation. While there is a tendency for the infection to extend to the lining of the Eustachian tube with gradual extension to the middle ear, the gross tissue changes are of only secondary importance to the accompanying infection in the problem of deafness. The conduction apparatus, when considered as a mechanism for the protection of the nicely adjusted perception apparatus, is wonderfully arranged. With the tissue reactions following a focal infection due to a particular strain of bacteria in all forms of deafness, there seem to be changes in the conduction apparatus analogous to those taking place in other organs which are damaged as the result of a similar focal infection. In all cases there is a functional disturbance of the perception apparatus, and in the organ of hearing, as in other organs, the restoration of function is dependent on whether its special nerve mechanism is irreparably damaged or only functionally disturbed.

Many otologists since the days of William Meyer have recognized the importance of removing infected adenoids and tonsils. Many now recognize that adults carry infection throughout life in the lymphoid tissue with an accompanying low-grade pharyngitis. It is not only necessary to remove these foci in cases of deafness, but all contributory infective areas in the teeth, sinuses or chronic mastoids, that drain through the lymphatics. In a given individual, the balance between the infective agent and the natural immunity of the patient due to the bactericidal and antitoxic powers of the tissues, blood plasma and cells, varies markedly. When this balance is once disturbed by any cause that lowers the resistance of the host and systemic infection results, the remotely involved tissue becomes sensitized, and less toxin than would affect a normal individual suffices to continue the morbid process. This makes the presence of innumerable saprophytes in the mouth and pharynx and such pathogenic bacteria as the *Streptococcus mucosus, S. viridans* and *S. hemolyticus,* the *Micrococcus catarrhalis, Pneumococcus, Bacillus mucosus capsulatus,* grippe bacillus, diphtheria and pseudo-diphtheria bacilli, which may be found in infected lymphoid tissue and the sinuses, particularly dangerous to the carrier. Furthermore, such infectious foci of the head may be associated with secondary infection of the lymph nodes of the neck and mediastinum. These patients have low resistance, and overwork is as potent in activating the focal process as is exposure. With these conditions present, and judging from the analogy of similar tissue reactions in other organs and from clinical experience, it is the conviction of the writer that deafness is the manifestation of a systemic infection resulting from a special strain of bacteria, the toxin acting on the perception apparatus from the beginning and continuing so to act until the terminal stage of marked perception deafness or nerve degeneration, the accompanying gross tissue changes in the conduction apparatus playing but a minor rôle in deafness.

With a primary infection that was accompanied by deafness each recurring exacerbation adds to the damage of the tissues originally involved. That is, if the tissue reaction was in the mucous membrane, the fibrous tissue or bone, it continues as such, and we have a progressive chronic catarrhal, catarrhal adhesive otitis media or possibly otosclerosis as long as the chronic focus is active or secondary foci continue the same type of infection. We have the same circulatory changes, the same pouring out of leukocytes from the blood stream and increased secretion with the formation of fibrous bands or the deposition of new bone. The analogy goes further, for we have at once functional disturbance of the end organ—that is, the acoustic centers and tinnitus. This occurs at once in every form of deafness. We may cause absorption of the inflammatory products in the tube or middle ear, but the restoration of hearing depends on whether the perception apparatus can be functionally restored.

For these reasons, Emerson has been forced to the conclusion that deafness is from the first concerned with the perception and that the conduction aparatus plays but a minor rôle.

While the gross changes in the Eustachian tube and middle ear interfere with the transmission of sonorous vibrations these do not come within the range of ordinary conversation. Furthermore, the low limits clear up with the unblocking of the tube in acute conditions, even though perception for the whispered voice may be further lost. What is of more importance in the loss of tone perception resulting from a blocked tube is pressure on the stapes. While this seems to affect only sonorous vibrations and therefore is of secondary importance in the treatment of deafness, it undoubtedly is important in causing tinnitus. Tinnitus is another term for labyrinthine stimulation or irritation, so that pressure and toxemia seem to be important factors in the gradual loss of tone perception.

We have, then, in every deep chronic infection of the lymphoid tissue which has been followed by deafness, two ways in which its progress is manifest. First, by gross changes affecting the conduction apparatus but playing but a minor rôle in the loss of tone perception. Second, by the action of a toxin on the end-organ impairing the function of the accoustic centers or, in a less number of cases, manifestly involving the cochlear nerve.

While the iodides, pilocarpine, strychnine, electricity, auditory re-education, etc., are indicated in these cases, it is also necessary to improve the general condition.

The loss of tone perception through depressed nerve states seem best treated on broad general lines. Many cases of deafness that have existed over a long term of years will improve markedly. In others the duration may be short and yet the treatment is hopeless. At present there seems to be no way of determining how far the perception apparatus is damaged or, in case of nerve involvement, whether degeneration is far advanced. Progressive or perception deafness has a most hopeful outlook if treated early and energetically when the cochlear nerve is not involved. All patients who have had a deep infection as a result of measles, scarlet fever, diphtheria or flu should have an interval tonsil and adenoid operation as a routine procedure without regard to age. Every patient who has a blocked tube and tinnitus accompanying a so-called acute infection should be carefully examined for a definite focus which should be treated surgically before secondary foci result. After this the follow up treatment should be local and general. All patients with long-standing focal infections are about 20 per cent. anemic and many have cardiac and renal conditions needing general medical care. The usual methods of treatment are all indicated under special conditions. In chronic progressive deafness, until the low limits are raised, however, the two important indications are the prevention of tubotympanic catarrh by the removal of chronic streptococcus foci and the recognition that impairment of tone perception is constantly going on.

1. Every case of loss of tone perception seems to result from the action of the toxin of a chronic pyogenic focus on the end-organ.
2. The toxin is probably due to a special strain of bacteria with a selective action on the organ of hearing.
3. The gross tissue changes seem analogous to those taking place in other organs, as the result of a focal infection, the return of function in each case depending

on the integrity of its special nerve mechanism either the acoustic centers or cochlear nerve.

4. Diminished tone perception seems to start with the onset of the deafness and is more important than the changes in the conduction apparatus. The early raising of the low limits due to the blocked tube clears up as the tube opens. Following this the tube is more open on the side of the deaf ear as atrophy succeeds the hypertrophic salpingitis.

5. When the $256C^1$ or $512C^2$ fork shows lowered bone conduction nerve deafness is already far advanced.

6. The end-result in chronic progressive deafness is marked perception impairment or nerve degeneration.

7. No hearing test is characteristic of any particular form of middle-ear disease.

8. Gross tissue changes in the middle ear follow the original type of infection and do not change.

9. Alcohol and tobacco seem to cause eighth nerve deafness by causing a pharyngeal congestion with increased absorption of the toxin from the chronic focus.

10. Patients treated early have every right to expect recovery if the primary focus is removed and the deafness is confined to a functional disturbance of the acoustic centers.

Syphilis as a Cause of Non-Suppurative Neurolabyrinthitis. This subject is discussed by J. L. Maybaum.[1]

Of all the cranial nerves, none is so vulnerable to the syphilitic infection as the eighth nerve. For this reason it frequently happens that the eighth nerve is first to feel its influence and the otologist is thereby afforded an opportunity to recognize the general character of the disease from the start. In a majority of cases, the cochlear branch is affected to a far greater degree than the vestibular. The cochlear and vestibular branches may be simultaneously affected, but as a rule the cochlear branch is first to be involved. While the recovery from

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(1) Ann. Otol., Rhinol. and Laryngol., September, 1921.

vestibular symptoms is complete under appropriate treatment, the symptoms due to cochlear involvement, tinnitus and impairment of hearing, are likely to be more or less permanent; a few cases of neuritis of the vestibular nerve alone have been reported. Some patients do not complain of ear symptoms, though it is not difficult to demonstrate the associated aural involvement. A larger number present predominant ear disturbances and in less frequent instances examination of the ear leads to the diagnosis of cerebrospinal disease. It must be remembered that though the cochlear nerve is considered most frequently attacked, a complete examination of these cases shows interference with both cochlear and vestibular functions.

In the majority of cases, the first symptom to attract the attention of the patient in whom the cochlea branch is involved is an abrupt onset of tinnitus—usually bilateral—which soon becomes constant, diminishing only as the pathologic changes in the nerve progresses or as the patient responds to thorough treatment. Following this, sudden impairment of hearing, usually very profound in degree, is noticed. No assistance is obtained from the drum picture as it is not affected in any characteristic way, whereas a coincident suppuration or a pre-existing chronic middle-ear catarrh may actually obscure the etiology. That a mixed condition, syphilitic involvement of the inner ear and eighth nerve, combined with chronic catarrhal or suppurative otitis media, does exist is accepted by otologists everywhere.

Where reliance is placed mainly upon the history and otoscopic picture pointing to chronic middle-ear catarrh, rather than upon functional test findings, the otologist is apt to overlook the inner ear and eighth nerve condition and satisfy himself with a diagnosis merely of the middle-ear lesion. In most cases, little can be expected of a patient's history. In patients in whom the hearing and equilibrium tests show involvment of the inner ear or eighth nerve, the Wassermann test should be made. This also obtains in all those cases of middle-ear affection in which the hearing is found to be reduced below that allowable for uncomplicated middle-ear disease and in which the suspicion of complications in the inner ear and nerve has been confirmed by tuning fork and vestibular tests. When the blood Wassermann is negative in strongly suspicious cases, a Wassermann test upon spinal fluid should be made.

If, in addition to cochlear involvement, the vestibular branch is affected, the symptoms to which it gives rise are far more distressing to the patient. Attacks of vertigo, disturbance of equilibrium and sometimes vomiting result. The vertigo is characteristic of the labyrinthine variety, causing subjective sensations of objects revolving about the patient. These attacks, lasting two or three days, are not infrequently varied by intermissions, during which the patient is entirely free from symptoms. Neuritis of the seventh nerve as a concomitant involvement, may be present, manifesting itself as a facial paresis, complete paralysis seldom occurring. At times the facial nerve involvement preceded that of the eighth nerve, in contradiction of inflammatory affections of the labyrinth, in which the paralysis follows or is concomitant with labyrinth symptoms. The extrinsic eye muscles are next in frequency involved. The fifth nerve, seldom affected, produces characteristic paresthesias in the areas of its distribution.

In tabes, Haberman found almost complete degeneration of the cochlear and partial degeneration of the vestibular nerve. The nerves were replaced with connective tissue and here and there were found distinct signs of neuritis still present. These changes indicate secondary atrophy following a primary neuritis.

The characteristic and diagnostic findings in cases of inner ear or nerve deafness are, as regards the cochlear apparatus, as follows:

Conversation may be heard fairly well, while the watch, acumeter, and especially the Galton whistle, will elicit little if any response. Weber is referred to the better ear. In a unilateral case of pure internal ear disease Maybaum observed, in the milder grades, a Rinné positive, but as the deafness increases the character gradually changes until it becomes plus minus eventually, with absolute deafness, the Rinné becomes negative (infinitive). The reason for the negative Rinné is that the bone conduction is transferred from the sound ear. Usually both ears are affected in syphilis, so that the positive character of the Rinné is accentuated. In testing the complete range of hearing with tuning forks, islands of hearing may be demonstrated. There is a decided shortening of bone conduction. These findings point to a lesion located in the inner ear or its nerve.

In the marked shortening of bone conduction we have one of the most reliable and striking evidences of luetic infection, as it is perhaps a most striking sign, occurring in 95 per cent. of cases. A deafness without apparent middle-ear trouble showing a positive Rinné should at once arrest the attention of the aurist. There is a marked lowering of the upper tone limits so that high-pitched tones are badly heard, low pitched tones are better heard than the high pitched. O. Beck, of Vienna, is of the opinion that the prolonged bone conduction present in middle-ear disease of non-syphilitic is absent in syphilitic cases. In his opinion, shortening of bone conduction in cases of syphilitic auditory neuritis is present in a large number of cases even in the primary stage before the appearance of general symptoms. He reached the following conclusions:

1. Impaired hearing with apparent middle-ear disease showing a positive Rinné should at once arrest the attention of the aurist.
2. Shortening of bone conduction is one of the most constant, reliable and striking evidences of luetic infec-

tion. This shortening of bone conduction and, at times, gradual daily impairment of vestibular function, is one of the earliest signs of constitutional syphilis.

3. Recognition of syphilitic auditory neuritis is of paramount importance, as this may be evidence of an incipient cerebrospinal syphilis.

4. Salvarsan, far from causing the continuance or recurrence of syphilitic auditory neuritis, is a means of curing the condition.

5. Prognosis of acquired syphilitic auditory neuritis, while fairly good as to improvement of hearing, should be guarded. Prognosis of the hereditary type is bad.

6. Non-suppurative neurolabyrinthitis, as a cause of Méniere's symptom-complex, may be associated with chronic middleear catarrh or suppuration. Reliance therefore, should not be placed upon the history or otoscopic findings, but upon functional ear examinations and laboratory findings.

7. Focal infection or metabolic disorders may be the causative factor in obscure cases of Méniere's symptom-complex.

Acute Suppurative Labyrinthitis. In discussing acute diffuse suppurative labyrinthitis J. Friedman and S. D. Greenfield[2] call attention to the classifiication into circumscribed and diffuse suppurations as found in most modern text-books. They are inclined to believe that in those cases in which recovery takes place with no impairment of hearing, the process has not gone on to suppuration, and the so-called localized or circumscribed acute suppurations are nothing more than those non-suppurative changes, which run their course with labyrinthine symptoms, and are capable of subsiding, *vis.*, increased labyrinthine pressure due to hyperemia and hemorrhage and the labyrinthitis serosa of Alexander. In this respect they refer particularly to the acute cases.

Many patients present themselves with chronic sup-

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(2) New York Med. Jour., Nov. 16, 1921.

purating ears, complaining of impaired hearing, and, after careful questioning, admit of occasional attacks of vertigo. These are nothing more than cases of chronic suppurative otitis media, plus a chronic circumscribed suppurative labyrinthitis. This latter additional diagnosis is of the utmost importance. The pathologic process in these cases has involved one or more of the semicircular canals (most often the horizontal) and, in consequence, these patients have a highly sensitive vestibular apparatus, by reason of the easy access of atmospheric changes to the inner ear as a result of the fistulous communication. The fistula can be demonstrated by the alternate condensation, and rarefaction of the air in the auditory canal. A positive test shown by the employment of the Politzer bag is one in which, upon sudden condensation of the air in the canal, there will be elicited an induced nystagmus in one direction, and, upon sudden rarefaction, a nystagmus in the opposite direction. The nystagmus, it should be remembered, is not typical, not rhythmic, but jerky and irregular. The fistula test is not always positive. Its absence does not preclude a functioning labyrinth. From a fistula test the authors draw three conclusions: first, the absolute evidence of a fistula; second, an active functioning labyrinth; third, a localized or circumscribed form of labyrinthitis.

When bone conduction is completely gone after the onset of the labyrinth affection, we may justly conclude that we were dealing with a purulent labyrinthitis. The dead labyrinth after a time is well compensated for, the other labyrinth assuming responsibility for both, so that the process when it has ceased leaves the patient with a well-balanced vestibular apparatus. The acute suppurative form runs a rapid course; its onset is usually sudden and the symptoms are violent and most striking, and the patient is apparently very ill within a few hours. The irritative stage is of short duration, and often it is a question of only a few hours before the labyrinth perishes. This is particularly true in children, in whom it is oftentimes entirely overlooked. In the early irritative stage the nystagmus is directed to the affected side and the cochlea still functions, audition being present. As soon, however, as the labyrinth loses its irritability, the nystagmus becomes directed to the well side, and the cochlea ceases to function.

Diagnosis of acute suppurative labyrinthitis is difficult especially when there are intracranial complications to be considered, and when labyrinthitis co-exists and is responsible for the incracranial lesion. A careful investigation into the patient's history before the onset of the condition, with special attention to the hearing power, and the occurrence of attacks of vertigo and disturbance of equilibrium, the performance of an accurate functional examination and, lastly, a knowledge as to the proper interpretation of the data at hand, all of which will aid materially in arriving at a more accurate conclusion.

One of the pronounced subjective sensations resulting from labyrinthine irritation is that of vertigo. Vertigo may be defined as that subjective sensation resulting from disturbed function of one of the three tracts having to do with the maintenance of equilibrium. Briefly these tracts may be described as follows: 1, vestibulo-ocular; 2, vestibulo-spinal, and, 3, vestibulo-central. The first of these tracts is connected through Dieter's nucleus, and the faciculus longus with the corpora quadrigemina and the ocular muscles. The second connects with the spinal centers of the cord and gives us muscle and arthrodial sense necessary for the maintenance of equilibrium. The third connects with the higher centers in the cerebellum. Destruction of any of these three tracts results in vertigo. The remaining two after a time can be sufficiently trained to enable the patient again to maintain equilibrium. Disturbance of the vestibulo-ocular tract is exemplified in cases of labyrinthitis; of the vestibulo-spinal, in tabes dorsalis, and of the vestibulo-central in cerebellar lesions.

The vertigo from which the patient suffers in labyrinthine irritation is characterized by the movement of objects. The objects move in the same direction as the rapid component of our nystagmus, or, in other words, they move opposite to the direction in which the patient falls. The one notable feature of vestibular vertigo, and a point of the greatest value in diagnosis, is the tendency for it to diminish day by day rather than to increase, as is the case in cerebellar disease. The vertigo of vestibular origin, especially when severe, is frequently associated with nausea and vomiting. It is frequently physiologic, seen in some normal individuals, and is encountered most often in patients with high degrees of myopia and in albinos. It occurs in all positions of the eye, and is not increased in any one position. The rapidity of movement is equal in both directions, so that we have neither quick nor slow component. Vestibular nystagmus is characterized by the fact that we have a rapid movement in one direction and a slow movement in the other. The slow movement is the true nystagmus resulting directly from labyrinthine irritation. The quick component is the cortical correction and is voluntary and results from activity of the higher centers. The vestibular nystagmus is named according to the rapid component because it is more pronounced and easier to follow. Vestibular nystagmus is characterized by the fact that it tends to diminish day by day. Central nystagmus is the result of lesions in the cerebellum. It is characterized by its tendency to increase day by day. The position of the head does not in any way influence the direction of falling. The patient usually falls to the side of the lesion.

The disturbed equilibrium results from irritation of the vestibular nerve filaments. It is manifested by the patient falling when assuming the erect posture. In disturbed equilibrium due to vestibular irritation, the falling bears a definite relation to the nystagmus. The patient always tends to fall away from the quick component. Furthermore, with changes in position of the head the direction of falling is also influenced. For example, if a patient has a nystagmus to the left, he will fall to the right. Now, if the head is turned to the left, the direction of the quick component of the nystagmus is directed backward and the patient will fall forward. Likewise, if the patient's head is directed to the right, the patient will fall backward, the nystagmus now being directed forward. The disturbed equilibrium of vestibular origin tends to diminish daily, the two remaining tracts being sufficient to maintain equilibrium after a period of training.

In regard to the treatment of these cases, great difference of opinion exists. However, the controversy must of necessity be justified, when we recall the fact that the classifications of the forms of labyrinthitis are so varied and numerous. A universally accepted plan of treatment does not seem possible, even if we were all to agree upon the same basic division of these cases, for the great field of possibilities, varied courses and supervening complications render each case a subdivision in itself.

With a properly applied and interpreted functional examination, we can come to a more or less definite conclusion as to whether the static labyrinth is still functioning. Having decided that it is, in the absence of further complications, there is only one form of treatment to follow, and that is the expectant one. We have no right to interfere when the labyrinth is still irritable, and when audition exists. As soon as the labyrinth ceases to function, it is probable that the process has gone on to the formation of pus. Even with this diagnosis definite, we still have no indication to interfere so long as there are no evidences of extension to endocranial structures. Pus in this location as in other places can well be taken care of, even if radical measures are not instituted immediately to facilitate drainage. After the acute symptoms have abated, however, something more radical may then be considered. If during the active stage definite symptoms develop, which indicate possible extension, then the authors would not advise procrastination. Meningitis, which is by far the most common complication arising from a suppurative labyrinthitis, must be borne in mind. Any evidence of meningitis calls for immediate intervention. In this regard, the writers emphasize the great importance of early lumbar puncture and its frequent repetition and the changes in cytology and chemical composition carefully studied. Unfortunately, many cases are complicated and atypical, and just when to interfere is often a question. To wait for a rigid neck and a spinal fluid swarming with microörganisms when a meningitis is well established, before draining the labyrinth does not offer much hope for the patient.

The Nose and Throat

GEORGE E. SHAMBAUGH, M. D.

DISEASES OF THE NOSE AND THROAT.

INTRODUCTION.

The year's work in otolaryngology includes a discussion of a wide range of topics. A healthful trend is noted in the increasing tendency to discuss the clinical problems relating to this field rather than restricting attention to operative technique.

The important problem of anesthesia is being more carefully considered and the risks peculiar to nose and throat work from both general and local anesthesia are being examined. Closely related to this problem, the danger from lung involvent following nose and throat operations is again brought out and methods for preventing this complication are discussed.

In sinus work, the relation to eye disturbances is receiving careful attention. It is apparent that much has still to be done before this problem can be definitely worked out. There is a tendency to emphasize the non-suppurative hyperplastic disease of the ethmoid, and perhaps of the sphenoid, as taking an important part in the etiology of eye complications. We feel that this problem still needs a great deal of careful clinical observation before we can know exactly where we stand. The occurrence of sinus infection in children has often been emphasized, and the peculiar difficulties in making a satisfactory diagnosis and the limitations to surgical treatment have been clearly pointed out. The part played by sinus infection in the etiology of systemic infection (appendicitis) has again been emphasized.

Asthma and symptoms of anaphylaxis and the allied problem of hay fever are receiving the attention which these conditions deserve. Work has been pushed along the line of immunization as a method of relieving the suffering caused by this malady. The status of this work is still far from satisfactory; the problem is one of unusual interest, but the results so far obtained are too conflicting to warrant any great degree of optimism that this trouble can be satisfactorily handled by this method.

As might be expected, both *x*-ray and radium are being tried out in the treatment of a wide range of intractable nose and throat conditions. Especially favorable reports are made from the radium treatment of laryngeal pappilloma. Radium is also being tried in treatment of the hyperplastic form of ethmoiditis. Not a little stir has been created by the claim that radium is able to cure chronic tonsillitis; this claim is based on the well-known fact that lymphoid tissue can be shrunken by the application of radium. It is to be expected that radium or the *x*-rays will reduce the size of hypertrophied tonsils. It does not follow, however, that the reduction in size is capable of eliminating the infection which, of course, is the real menace rather than the hypertrophy of this strucure. Thus shrinking of the tonsil is a not infrequent result of previous chronic tonsillitis, and clinical observation has shown that the tonsil shrunken this way is fully as often a seious menace, so fa as systemic infection is concerned, as is the hypertrophied tonsil. These clinical facts, not to speak of the as yet unknown damage to the other structures from the application of radium, do not warrant the substitution of radium application for the enucleation of the tonsil when this structure is shown to be a menace.

An interesting contribution is made on the relation between the tonsils and ductless glands. This topic will no doubt in the near future be the subject of careful study in many quarters.

GEORGE E. SHAMBAUGH.

Anesthesia in Nose and Throat Work. The special committee appointed from the section on Laryngology, Otology and Rhinology of the American Medical Association to study and report on the advantages and disadvantages of local anesthesia in nose and throat work submitted the second part of their report[1] to the section at the seventy-second annual session of the association, held in Boston, in June, 1921. The first part of the report was read at the New Orleans session in April, 1920, and was abstracted in this volume, last year, pages 275-277. The committee consisted of Drs. Emil Mayer, Ross Hall Skillern, Robert Sonnenschein, and William B. Chamberlin.

In an attempt to enlist the co-operation of each Fellow, who, during the last five annual sessions, had registered in the section, a letter was sent to each one, containing the following questions:

1. Have you during 1919 and 1920 noted any toxic effects, fatal or not, following the use of a local anesthetic?
2. If so, please submit a case report in each instance.
3. Kindly inform the committee of the name and address of any physician known by you to have had such experience.

Fourteen hundred such letters were sent out with 315 replies. Question 3 was the most valuable in the matter of replies. The alleged deaths thus reported were thirty-two, and in each instance attempt was made toward verification. Five of these were reported as errors, but twenty-seven were substantiated. From twenty-two of these, detailed case reports were sent in. Of these twenty-two deaths eleven were from cocaine (three mistakes of nurses), five from procaine and cocaine, three from procaine only, one from apothesine and

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(1) Jour. Amer. Med. Ass'n., Oct. 22, 1921.

cocaine, one from apothesine only, and one from alypin and cocaine. All of these fatalities occurred within the last two or three years, and with the exception of three, none has been reported in the medical journals.

The amount of epinephrine used was carefully gone into, and in no instance could this preparation be considered as an agent in causing death.

Of the cocaine deaths, seven patients were injected hypodermically, one had an injection in the bladder, one spray in the larynx, and two had packing in the nose. Three of these were due to avoidable mistakes. The cocaine-procaine deaths had the former drug applied in strengths varying from 100 to 20 and 10 per cent., respectively, just prior to the injection of the procaine. In the cocaine-apothesine death there was a preliminary swabbing of a 4 per cent. solution of cocaine, followed by the injection of the apothesine solution. In the one apothesine death the patient was so far advanced in tuberculosis that any slight shock would have killed him, and this death is not accepted as being solely due to apothesine.

In practically all of the cases convulsions occurred within three minutes of the administration of the local anesthetic, and death ensued anywhere from twenty minutes to several hours afterward. In none was there any return to consciousness from the first symptom, although every known method of resuscitation was used in each instance.

Nineteen of these patients were in an upright position; three were reclining or semi-reclining. The committee firmly advocates the reclining or semi-reclining posture in order to relieve the heart of as much strain as possible.

The question of having ampules made by the manufacturer containing solutions of synthetic drugs used has also been favorably considered by the committee as a possible means of avoiding mistakes made in handling these powerful drugs by irresponsible persons.

Although deaths from the administration of local anesthetics are apparently far in excess of the number reported in the medical journals, still, the freedom from ill effects noticed by so many who have used these drugs has made them oblivious to the likelihood of danger.

[A few out-standing facts in regard to local anesthesia should be kept clearly in mind. Cocaine is much more toxic than any of the other agents usually employed. There exists a marked individual variation in the susceptibility to the toxic action of cocaine. Cocaine is much more dangerous when injected than when applied locally. In applying cocaine locally one is able to secure as complete an anesthesia by the use of a weak solution (5%) as by the stronger solution or even the pure crystals.—Ed.]

Pulmonary Complications Following Nose and Throat Operations. Of the various complications in the chest which may follow operations on the nose and throat, that of acute abscess of the lung is most to be dreaded. At present, two distinct theories are advanced as to the cause of this complication; first, the inhalation of blood-clots, pieces of tonsil, adenoid, or of the debris from the crypts of diseased tonsils; second, from emboli or septic infarcts. R. C. Borden[2] believes that only two of the various varieties of emboli mentioned can be considered as causal factors in lung abscesses. These are liberated thrombus and bacteria. The inhalation theory is probably the one which can best explain the great majority of lung abscesses following nose and throat surgery. The author believes the reason they occur no oftener is because a system of reflexes guards the breathing apparatus, and does it so thoroughly as to prevent the condition except in rare instances. Stimulation of the nasal mucous membrane causes an inhibitory action of respiration, which protects the lungs from irritating and injurious gases, etc. The pharynx receives its reflex from the sensory fibers of the glossopharyngeal nerve. Stimulation of this area produces arrested

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(2) Laryngoscope, November, 1921.

respiration and a closure of the cords during the act of swallowing. A foreign body of any size in this location will produce similar action. The mucous membrane of the larynx receives its sensory fibers from the superior laryngeal nerve, stimulation of which closes the glottis by contraction of the adductor muscles, and it also produces temporary suspended respiration or cough. If anesthesia is carried to the point of abolishing the throat and lung reflexes, the natural protection of the lung cavity is gone. The vomiting reflex is also of importance, and is similar to the cough reflex, for in vomiting there is the same air compression in the lungs as in coughing. Vomiting may clear the lungs of foreign matter, or it may cause foreign matter to enter the breathing cavity, causing death. Lung abscesses and ether pneumonia have often had their beginning after the patient has safely left the operating room, because of inhalation of stomach contents during vomiting.

Another factor which the author considers is of great importance in considering the dangers from inspiration, is the marked tendency in nose and throat patients to over-secretion of the glands of the mouth, pharynx, and larynx. The very nature of the trouble naturally brings this about. If this amount is great or if its consistency is viscid, it becomes a menace to the patient's safety.

Attempts have been made to overcome this handicap by the administration of atropine, but the author strongly believes that this practice is, in many cases, a mistake, as it simply causes a thickening of the mucous, producing long, thick ropes of the secretion, which are much harder for the patient to expell than the thin secretions. Sponging often fails to afford relief because of the length of the rope of mucous and its extremely sticky, clinging nature. Placing the patient in a position where the mouth and throat are lower than the larynx is the safest and most satisfactory method of ridding him of this embarrassing complication. The use of morphine, in Borden's experience, interferes with even respirations during the latter part of anesthesia, and in some cases depresses the inspiratory center, causing shallow muscular action. He therefore believes it is contraindicated in nose and throat work.

As regards the anesthesia, the anesthetist should keep the patient breathing quietly with laryngeal reflexes present, and yet be sufficiently passive to allow the operation to proceed for almost any length of time. Borden believes that the claims made against a proper power-driven apparatus are much over-estimated, and are distinctly a step backward in nose and throat anesthesia. All traces of hemorrhage should cease before the patient leaves the operating room, and when he is placed in bed following an operation a skilled nurse should always be in attendance until the patient is able to care for himself.

[It seems probable that lung abscess following, for example, tonsil removal occurs oftener than we know of, for the reason that these patients leave the hospital and pass largely from observation before this complication has an opportunity to develop. Anything which increases the chance of inhaling infected material pressed from the tonsil during operation, cheezy concretions, for example, should be carefully avoided. The risk of inhaling particles in this way is increased by the use of morphine in connection with the general anesthesia by the practice still adhered to in some places of operating with the patient sitting upright, as well as by operating with the patient recumbent and with a pool of blood in the pharynx. For a tonsil operation under general anesthesia the patient should be recumbent and the field of operation kept free from blood by means of a suction pump, or, as we prefer, with the patient turned on the side permitting the blood to drain out of the mouth.—Ed.]

Post-Nasal Choanae Malformation by Bony Occlusion. An additional diagnostic aid in these cases is mentioned by C. Kirby[3] and consists in noting the peculiar bluish color and consistency of the nasal discharge and the anemic turbinates that are practically always present in this condition of occlusion. The only other condition in which the turbinates have the same appearance as in these cases is in tuberculosis of the turbinal bodies. A careful history should always be obtained from these patients—usually children—as it is often of the utmost value in determining the source of the trouble. The general health has usually been poor; malnutrition is often evident. There is usually a history of nasal obstruction which has not been relieved by the removal of tonsils and adenoids. Frequently the patient has been subjected to a secondary adenoid operation. The mother may volunteer the information that the child would not take the breast well when a baby because the nose always seemed to be blocked up.

The author believes it advantageous to operate on these cases in childhood because, first, it helps in the development of the child; and second, the occlusion, if it is bony, is very thin as compared to that of an adult, which is more ossified. The disadvantages of operating on children are: the limited space for operation, and the oblique angle at which the choanae openings are placed.

The technique used by the author consists in a submucous resection, and removal of the bony malformation through the nose. A window flap of mucous membrane having its base at the pharyngeal side of the choanae is made and used to cover the denuded area, thus giving less opportunity for granulation. Rubber tubes about ½ inch in diameter are then inserted to preserve the continuity of the opening; these tubes are cleaned and re-inserted daily for about two weeks. For the first week or two following operation, there is usually a marked increase in the amount of mucopurulent discharge, which then gradually disappears.

[A constant symptom of congenital atresia of the

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(3) Laryngoscope, September, 1921.

choanae is the filling of the nasal passages with mucous secretion which the patient can not expel. The absence of any middle-ear trouble in these cases is a conclusive argument against the popular belief that nasal obstructions such as occur from irregularities of the nasal septum have anything to do with causing middle-ear disease.—Ed.]

Headaches of Nasal Origin. In considering the diagnosis of peripheral nasal headaches, P. Watson-Williams[4] classes as the simplest cases those due to pressure of the middle turbinate on the septum nasi. Usually there is a deflected septum, and then the middle turbinal body, when turgid or congested, becomes crowded against the corresponding part of the septum, causing a feeling of tightness in the nose, and headache, usually supraorbital, which is prone to arise when the head is low, as in stooping over, or when the patient is in bed. It may be intermittent in character, coming on when the nasal mucosa is irritated by dust or pollen. Such headaches are temporarily relieved by spraying with weak cocaine or adrenalin solution, and may be cured by removal of the anterior third of the offending turbinate.

However, the author believes that in only a comparatively few cases can the question be answered so simply, for upon inquiring as to the cause of the periodic swelling of the turbinate, it is very often found that the basic cause of the trouble is a sinuitis, and that it is the consequent turgescence of the whole nasal mucosa, superadded to a much longer standing narrowing of the nasal passages by the septal deflection, which causes the troublesome headache and blockage of the nose. In such cases removal of the obstruction, leaving the infective sinuitis, is merely treating a symptom rather than a disease. The headache may be the most obvious but by far the less serious of the symptoms. The peripheral source of the headache may and often does lie not in the nasal passages, but in the nasal sinuses. The sensory

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(4) Lancet, Feb. 18, 1922.

innervation of the accessory sinuses is derived from various branches of the fifth nerve and irritation from inflammation of the lining mucosa or, in acute cases especially, pressure on the inflamed muco-periosteum by the accumulating pus causes severe and sometimes agonizing neuralgic pain. The pain is very often referred to regions by no means corresponding to the offending sinus. In some chronic cases a toxic absorption may induce a laziness of the intra-ocular musculature, so that a relatively slight degree of refractive error, which would be well compensated in health, becomes a source of headache. Hence, even headaches that are relieved by glasses may really be due to nasal affection.

The diagnosis of these cases of peripheral nasal headache is often difficult and must be approached in a way similar to that followed in the diagnosis of any chronic sinus infection.

[A timely discussion of an important problem. We are convinced that headaches caused by anatomic variation in the nasal septum are largely a myth except where the irregularity of the septum impairs seriously the normal ventilation of the nasal tissues. Whether the headache arising in this way results from rarefaction of air in the sinus (frontal) we are still in doubt.—Ed.]

A Case of Nodular Headache of Nasal Ganglion Origin. Nodular headache is characterized by the presence of nodules from the size of a pea to that of a hazel nut, in some part of the scalp or nape of the neck, which are supposed to be the cause of the headache. Many theories have been advanced as to their origin and relation to headache. Greenfield Sluder[5] believes that these nodes are manifestations on the part of the sympathetic system not unrelated to some of the skin lesions of neurotic sensory or trophic origin. He reports the case of a woman 40 years old who gave a clear history of "lower half headache" of great severity from her childhood, stating that when it was very bad

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(5) Ann. Otol., Rhinol. and Laryngol., December, 1921.

"knots" came in her neck and over her scalp. Recently the author saw her in one of these attacks when the "knots" were present. At this time she had an unusually severe attack of nasal ganglion neuralgia. Two nodules were present at the lowermost part of the occiput, each measuring about one by two cm., and tender to touch. Full cocainization of the nasal ganglion relieved the pain and in one hour one nodule had completely disappeared. Within twenty-four hours the other nodule was much smaller and less sensitive, and in ten days was entirely gone.

Nausea as a Nasal Reflex. Nausea has been mentioned frequently as a symptom of nasal disorders of one kind or another, being one of a dozen or more symptoms, but Greenfield Sluder[6] believes that as an isolated specific reflex from the nose, it has not heretofore been observed. He noticed that upon injecting the sphenopalitine ganglion with plain 95 per cent. alcohol it was not uncommon to produce nausea. One patient became nauseated instantly by the injection and vomited for six days following, intermittently. More recently the author has added phenol to the alcohol injection and nausea has been much less frequent, but still sometimes follows. It is well known that severe pain produced by any cause will often produce nausea and vomiting, and anything that stops the pain in these cases stops the nausea. A severe nasal ganglion neuralgia is often accompanied by nausea, which ceases with the cessation of pain by anesthetizing the ganglion. Such cases the author has seen many times. Within the last year he has seen several cases in which there was no pain, although the nausea was severe. In one severe nasal neuralgia, pain was absent on many occasions, although a purposeless vomiting had continued for twelve hours, and was stopped in five minutes by the application of one drop of 90 per cent. cocaine to the nasal ganglion district. This has been repeated many times in this pa-

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(6) Ann. Otol., Rhinol. and Laryngol., December, 1921.

tient with the same results. In another case, one of hyperplastic suppurative sphenoidal headache, marked nausea without headache is sometimes manifest. Application of 90 per cent. cocaine solution to the floor of the sphenoidal cell stopped it in about ten minutes.

The author believes these two anatomic subdivisions of cases are to be thought of as one type, namely, that of sympathetic nervous system irritation.

The Relation of Nasopharyngeal Malignancy to Other Diagnosis. In reviewing the symptomatology of forty-six malignant tumors of the nasopharynx examined at the Mayo Clinic during the past four years, G. B. New[7] points out the lack of nasal symptoms in many of these cases, and the frequency with which such growths have been overlooked in examination. The growths are usually small in size, and located high in the vault or lateral wall of the nasopharynx above the Eustachian tube. Of such tumors, 50 per cent. occurred between the ages of 41 and 60. The symptoms varied in duration from five weeks to three years, and consisted of pain, double vision, drooping of the lid, gradual loss of hearing, nasal obstruction, enlarged glands of the neck, and intracranial symptoms. Seventeen only of the forty-six patients complained of pain, which varied from an earache to a very severe pain as if a hot iron were burning into the head. The pain was always on the affected side, extending over the frontal, temporal and mastoid regions and down the neck. In cases in which the Gasserian ganglion or the second and third divisions of the fifth nerve were involved by the direct extension of the tumor, sharp pain, similar to that in trifacial neuralgia, occurred, and later numbness over this area. Dull, constant headache was complained of in some cases. Some patients had had wisdom teeth removed, as the initial symptoms seemed to be located there. Some believed the pain in the head to be referred from the enlarged glands of the neck. Some had received anti-

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(7) Minnesota Med., July, 1921.

luetic treatment on account of having a positive Wassermann or a specific history.

Ten patients had eye symptoms, the most common being drooping of the lid and seeing double, following an aching of the face for several months. Eleven complained of their ears at the time of examination, a feeling of fullness in the ear with gradually increasing deafness being quite common. Paracentesis had been done in one case with temporary relief. A septum operation was performed later, but the ear gradually became deaf. An epithelioma around and involving the Eustachian tube was found.

Only twenty-four of the forty-six patients complained of nasal or nasopharyngeal symptoms. In nineteen of these the complaint was nasal obstruction; in three, recurring attacks of bleeding; and in two, increasing nasal discharge. Thirty-two of the series had enlarged cervical glands, eleven having been operated on elsewhere for glands of the neck without the primary focus being found. Sometimes a huge mass in the neck may be present when the primary growth in the Rosenmüller fossa is not more than 1.25 cm. in diameter. Nine patients had had tonsillectomy because of enlarged glands of the neck; four had had teeth removed; and six had had nasal operations, apparently without the discovery of malignant growth in the nasopharynx.

The author concludes that a study of these cases of malignant tumors of the nasopharynx emphasizes the need of a careful and thorough nasopharyngeal examination in all persons complaining of any of the above listed symptoms.

[In our experience, the earliest and most constant symptoms are those resulting from catarrh of the Eustachian tube. This condition, so common in childhood, as the result of adenoids, is not at all common in adult life. Its occurrence at this time should always call for a most careful inspection of the nasopharynx. It is surprising how small the growth in Rosenmueller's fossa may be which is causing the tubal obstruction.—Ed.]

Radium Emanation in the Upper Air Passages. The use of radium needles in the treatment of malignant growths in the upper air passages while on the whole quite satisfactory has had several drawbacks. Otto Freer[8] has overcome these drawbacks by using radium emanation. Emanation is a gas given off from radium that possesses all of radium's properties. It is given off by radium or its salts continually and for therapeutic use it must be collected and encapsulated in minute sealed glass tubes. To get enough for practical use at least one gram of radium is needed as the source of supply. Just as does radium, the emanation discharges alpha rays, large particles that have poor penetration so that they may be screened off by a few thicknesses of paper; beta rays, divided into soft beta rays with little penetration and hard beta rays that pass readily through a millimeter of silver; and gamma rays, rays of immense penetration that will go through a heavy lead plate.

Of these rays the alpha rays and the soft beta rays are shut off by a proper thickness of metal, usually the enameled silver tubule in which the emanation is encapsulated, as their action produces an undesirably strong inflammatory reaction in the integument liable to result in sloughs, so-called burns. The hard beta and the gamma rays are the ones that produce the desired effect upon morbid states while they produce but little reaction. They readily penetrate metal that is a millimeter thick, which easily screens off the alpha and beta rays.

Each capillary glass tube in which the emanation is collected is placed in a silver tubule 5/8 of an inch long and 3/32 of an inch in diameter. In the small size of these tubules lies a great advantage of emanation over radium proper in the treatment of nose and throat

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(8) Illinois Med. Jour., August, 1921.

affections. Even a very small amount of radium salt is quite bulky for use in certain locations, while a single tubule of emanation may be charged with as much as 400 millicuries, a millicure being the exact equivalent in radio-activity of a milligramme of radium. The tubule may be placed directly in the glottis without interfering with respiration, and increasing the emanation dose does not add to the bulk of the screen or contents. Doses of sufficient strength may be used to penetrate effectively not only all the diseased but also surrounding doubtful regions with dense radium rays.

For the purpose of applying radium emanation in the upper air passages, the author has devised a special apparatus with which it is possible to apply it anywhere with accuracy, even to a small nodule on a vocal cord. The fundamental principle of the method is the use of a strong clamp fixed on the forehead by a head-band and holding in the larynx or pharynx tubular applicators ending in the container or "screen" that holds the emanation. For the nose, simple wire applicators are fixed in small clamps attached to a light head-band.

Malaria and Eye, Nose and Throat Infections. Malaria lies latent in many people, especially in certain localities, and H. B. Searcy[9] has shown the important bearing which this latent, often unsuspected, infection may have upon the outcome of various eye, nose and throat conditions. In having many blood smears examined, positive reports for malaria were returned in a surprisingly large number. He reports a series of eighteen cases which had been referred to him because of eye, nose and throat symptoms, in all of which cases he found positive smears for malaria. Many of these individuals have responded very stubbornly to local treatment but immediately upon the administration of quinine along with the local treatment, the conditions cleared up with surprising rapidity.

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(9) Southern Med. Jour., May, 1922.

DISEASES OF THE NOSE.

INFECTIONS AND TUMORS.

Acute Infections About the Hair Follicles of the Nasal Vestibule. L. M. Hurd[1] points out the dangers which may arise from an apparently simple furuncle in the nasal vestibule. These small infections are usually treated by the patient himself, by pricking with a pin or picking with the finger nail and squeezing out the contents by pressure, thus rupturing the walled off cavity; as a result, the condition often becomes more serious. Wide incisions are not advisable in these cases as they serve to break down Nature's barriers about the area and allow free spread of the infection into surrounding tissues. Among the complications that may arise is the sloughing of the inferior lateral cartilage. The cavernous sinus may become infected more frequently than is generaly thought and the mortality of cavernous sinus thrombosis is practically 100 per cent. As soon as the slightest symptoms of cavernous involvement are present, the author believes it wise to ligate the anterior facial vein near the inner canthus, and also to ligate the anterior facial above the deep facial vein at the anterior border of the masseter muscle as soon as the infective area is seen to be increasing instead of diminishing. The infection extends along these vessels as well as along the angular and superior ophthalmic veins to the cavernous sinus. The ligation is a simple procedure and may save the patient's life.

Malignant Granuloma of the Nose. Sir Robert Woods[2] reports two rather unusual cases of malignant condition of the nose in which considerable difficulty

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(1) Med. Record, Jan. 21, 1922.
(2) Brit. Med. Jour., July 16, 1921.

was experienced in arriving at a diagnosis. Both cases were very suggestive of a syphilitic condition but the Wassermann reactions were negative and a rigid course of antisyphilitic treatment brought no response in either case.

Case No. I presented marked sinking of the bridge of the nose, a swelling in the region of the right lachrymal sac, with a fistula below the internal canthus discharging a watery fluid. Both sides of the nose were filled with fetid crusts, the cartilaginous septum was gone, some of the soft tissues were deficient, and the walls of the nose were markedly ulcerated. The odor was marked and more or less peculiar. There was much granulation tissue, which later developed into what greatly resembled a sarcoma, extensively infiltrating the soft palate. In time the palate showed a large perforation. The condition remained localized, not even any glandular involvement occurring. The *x*-ray was used extensively with no results, the patient dying four and a half years after the onset of the disease.

Case No. II presented very much the same findings, except that there was no sinking of the bridge of the nose, but marked extension of necrosis into the soft tissues of the cheek. Radium emanations were tried with decided improvement. This treatment was repeated in increasing doses at various intervals three times, apparently resulting in a permanent cure.

Two Unusual Nasopharyngeal Tumors. Two unusual tumors of the nasopharynx are reported by G. B. New[3] and consist of actinomycosis and primary lymphosarcoma. In the former case, there was a large non-ulcerated mass in the vault of the nasopharynx on the left side, almost protruding to the mid-line.

The patient, a man, aged 45, complained of inability to separate the teeth more than 1 cm., and pain in the left ear and upper jaw radiating around the eye and to the mastoid region. It was questionable whether

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(3) Laryngoscope, February, 1922.

the mass was inflammatory or malignant. The patient and his physician were told that it would not be advisable to remove tissue for diagnosis as the treatment would not be surgical in either case, and radium was applied. Seven weeks later the patient returned to the clinic with a large phlegmon having ruptured in the left temporal region just above the zygoma, from which actinomyces were demonstrated grossly and microscopically. The pocket was drained thoroughly and swabbed with iodine; potassium iodide was given internally and radium applied externally. Four months later, at the time of this report, the wound in the left cheek had almost entirely healed, the nasopharynx was negative, and the patient could open his jaw normally. The general condition was good and there was no pain.

The second case, that of primary lymphosarcoma of the nasopharynx, occurred in a woman who came to the clinic complaining of a small area on the left tip of the nose which was causing a burning sensation. Small scales were present on this spot and she was afraid it was a cancer. She had no other complaint in the nose, throat or head, and her general health was good. Examination showed a small area of keratosis on the left tip of the nose and a tumor about 2cm. in diameter in the right vault of the nasopharynx. Tissue removed from the tumor for microscopic examination showed that it was lymphosarcoma and it was diagnosed as primary in the nasopharynx. There were no palpable glands in the neck, and eye and ear examinations were negative. The author states that radium treatment in a case of this type is very satisfactory and may permanently clear up the trouble.

The Use of Radium in Treatment of Nasal Polyps. It is well known that the rapidly recurring type of myxomatous nasal polyps responds very unsatisfactorily to medical treatment or surgical removal. One reason that the operative results are not good is that the polyp has not a definite pedicle attached to the mucous membrane of a turbinate or a sinus. Removal of this tumor and its pedicle with the nearby tissue or cells does not eliminate the condition, because the adjacent tissue is also undergoing a myxomatous change, which will soon appear in the form of a polyp. The changed area of mucous membrane around the polyp may extend a considerable distance away from the pedicle. Surgery, in some instances, seems to stimulate the formation of polyps in this adjacent tissue.

H. R. Lyons[4] reports the use of radium on these growths, with very successful results. Radium stimulates the production of fibrous tissue, and after one, two, or three treatments, the primary myxoma recurs as a fibromyxoma or a fibro-adenomyxoma. This type of polyp is very much more satisfactory to deal with than is the myxomatous type.

The plan of procedure is to remove thoroughly all polyps together with a considerable amount of adjacent tissue which is not frankly myxomatous, but which, as experience has taught, rapidly recurs as such. As soon as the reaction diminishes, in from three to six days, radium treatment is given. Some very pale tissue at the location of the polyps is noted, which, within the next two or three weeks, becomes frankly polypous. This is usually fibromyxomatous in character. A second operation, not so extensive as the first, is performed and radium is again used. A third treatment is rarely found to be necessary.

The dosage used by the author is a 50 mg. tube inserted in the nose in the region of the polyps and held in place for two hours by gauze packing. The reaction resulting from this treatment is not apparent for forty-eight hours or more.

Nasal Diphtheria After Enucleation of the Tonsils. B. Seymour Jones[5] has seen five cases of nasal diphtheria at the out-patient department of the Birmingham

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(4) Amer. Jour. Roentgenol., July, 1921.
(5) Brit. Med. Jour., March 25, 1922.

Ear and Throat Hospital during the last year, in which the tonsils and adenoids were perfectly removed. The author does not desire to indicate that the removal of the tonsils renders a patient more susceptible to infection by diphtheria, but that through their removal, infection may be diverted to a situation where it escapes prompt recognition by the practitioner, thus delaying appropriate serum treatment, and often causing the patient to become a carrier and propagate the disease.

SURGERY OF THE NOSE.

A New Operation for Nasal Hemorrhage. In doing a mastoidectomy or other bone surgery a persistently bleeding point in the bone may be treated by driving a blunt instrument slightly into the bony tissue at this point. This suggested to Hugh Miller[1] the following operation for nasal hemorrhage:

After having thoroughly anesthetized the parts at the point where the terminal branch of the descending palatine artery emerges through the nasal opening of Stenson's foramen, cut directly downward and inward on this artery, dissecting away the soft tissue freely. Then take a dulled chisel, placing it over this foramen, and tap the chisel, chop up the bone so to speak around the orifice; it is possible to force the bony particles into the orifice. By means of the mallet and a dull blunted instrument drive the bony particles downward, inward, and forward, effectually closing the nasal orifice of Stenson's foramen. It is not well to use adrenalin or similar drugs during the operation as it is desired that all hemorrhage, other than mere capillary oozing occasional by the incision, be brought under control by the procedure of the operation itself. When the operation is completed, sponge away the surface and wait a few minutes to see if the hemorrhage has been successfully arrested. When the operator is satisfied that arterial hemorrhage is under control, the soft tissues are returned over the wound, and this portion of the nasal cavity loosely packed. The packing is merely to protect the wound and to collect the capillary oozing. It is left in place for twenty-four hours, after which a dusting powder is used.

The author reports some excellent results from this method.

Treatment of Recent Fractures of the Nose. Treat-

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(1) Jour. Mo. State Medical Ass'n., November, 1921.

ment of recent fractures of the nose should, in the opinion of L. Cohen[2] be instituted as soon after injury as possible, without awaiting the disappearance of swelling, no matter how great this may be. This principle has been followed with great satisfaction even in compound fractures where suturing was required.

To obtain a satisfactory reduction it is necessary to have complete mobilization of the parts, otherwise the nose will not remain in the proper position after being so placed. In young subjects a tendency to lateral deviation after reduction often exists, especially where a blow comes from the side resulting in a complete fracture of one nasal bone and a green-stick fracture of the other. Satisfactory reduction in such cases cannot be accomplished until the partial fracture is made a complete one. Septal displacement will also interfere with proper reduction in some cases. This can best be overcome by use of the Adams forceps, one blade being placed on either side of the septum and the entire nose lifted forcibly forward and upward. Generally during this manipulation the slipping of the bones into place can be felt.

Mobilization once accomplished, the fragments may be readily replaced by the aid of a small rubber-covered elevator held in the right hand and manipulated from the inside of the nose while the left hand remains over the outside. Reduction satisfactorily completed, the anterior portions of both nasal fossae and vestibules are packed with half-inch iodoform gauze tape and an external splint applied over the outside.

The splint devised by the author is cut from a sheet of 20-gauze copper, bent over a piece of iron pipe, then placed over the nose and moulded to fit properly. The copper is covered with adhesive plaster and after being fitted to the nose is lined with surgeon's lint before being fixed permanently in place. It is held fast by

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(2) Ann. Otol., Rhinol. and Laryngol., September, 1921.

adhesive plaster strips, carefully placed according to a plan worked out by the author.

There are many advantages claimed for this splint. It exerts equal pressure, thus holding all fragments in absolute alignment. It prevents their outward displacement, diminishing callus formation along the lines of fracture. Ridges, offsets and other irregularities due to such callus are prevented. It hastens the disappearance of swelling and prevents possible refracture during healing.

Invisible Scar Method in Cosmetic Nasal Surgery. The chief disadvantage of the intranasal method in cosmetic surgery of the nose is the inability of the surgeon to sterilize the operative field properly. I. Frank and J. F. Strauss[3] have devised an external operation which leaves an invisible scar in these cases. The technique consists in making an incision ¼ inch long, through the skin at the inner end of the eyebrow, down to the frontal bone through the periosteum. A periosteal elevator with a slightly curved shank is introduced and the skin and subcutaneous tissues are elevated from the bone and cartilage along the median line of the bridge of the nose down to the tip, the instrument being guided in its subcutaneous course by the operator's hand. Into the pocket thus formed, a slightly curved rasp may be introduced and humps removed; or in case of a depressed nose, a properly prepared transplant of bone or cartilage may be inserted.

For the broad nose, two incisions are required: the usual one in the left eyebrow and a similar one placed on the right side. Through these openings the periosteum covering the frontal processes of the superior maxilla is elevated and a small, specialy designed flexible saw is inserted. The processes are then sawn through at the base of the nasal bridge and the walls of the nose are pressed inward to a position cosmetically satisfactory and retained with an external splint of

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(3) Ann. Otol., Rhinol. and Laryngol., September, 1921.

padded heavy sheet copper. The incisions are closed with interrupted horsehair sutures. They heal rapidly and are usually invisible through the regrowing hair of the eyebrow by the time the stitches are removed.

A New Perichondrium Elevator for Resection of the Septum. C. A. Campbell[6] has devised a new perichondrium elevator which is claimed to be especially useful for those having difficulty in commencing the elevation of the perichondrium after having made the primary incision through the mucosa. The other end of the instrument makes numerous perforations through the cartilage, but does not injure the mucosa on the opposite side, thus allowing an ordinary submucous elevator to be forced through the weakened cartilage at an oblique angle. The mucosa may then be dissected as desired. The instrument is shown in Figure 20.

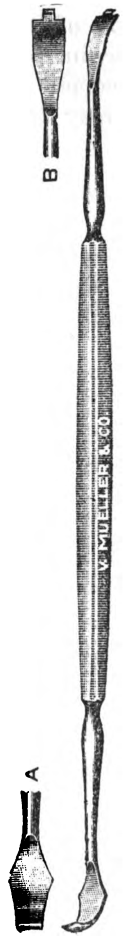

Fig. 20.—New perichondrium elevator (Campbell).

Use of Hollow Tube Following Submucous Resection of the Septum. It is well known that the complete nasal obstruction resulting from packing after a submucous resection of the septum is very distressing to the patient. It is particularly difficult for the patient to swallow during this period of twenty-four hours. H. M. Goodyear[7] has devised a method for overcoming this discomfort. It consists of a piece of pure gum hospital tubing 1/4 inch in diameter and from 2 1/2 to 2 3/4 inches long inserted along the floor of the nose opposite the

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(6) Laryngoscope, December, 1921.
(7) Jour. Amer. Med. Ass n., Oct. 1, 1921.

side of the primary incision; it is removed with all packing at the end of twenty-four hours. In case it becomes clogged, the patient may blow through it or it may be cleaned with an applicator (Plate XXVI)

THE NASAL ACCESSORY SINUSES.

Recent Progress in the Surgery of the Accessory Sinuses. In reviewing the progress made in surgery of the accessory sinuses, E. J. Moure[1] expresses the opinion that the Caldwell-Luc operation offers the best results in the majority of cases with a persistent infection in the maxillary antrum. He believes it is to this procedure that we owe most of the definite cures of chronic maxillary sinuitis.

In fronto-ethmoidal sinuitis the author employs in most cases a modification of the Ogsten-Luc operation, which he recommends most favorably. This consists in a combined internal and external procedure. The anterior ethmoids are thoroughly cleaned under cocaine anesthesia by the endonasal route. The external part of the operation consists in incising the skin along the line of the eyebrow, and making a rather large bony opening at the level of the frontal bos in order to inspect the whole frontal cavity, and to assure the operator that he has curetted it completely. This opening is insufficient to produce a very apparent mutilation, but in case more of the external table was removed than anticipated, the author closes the larger portion of it by an osseous flap removed from that part of the frontal bone adjacent to the site of operation. The nasofrontal duct is enlarged from above, free drainage being established through the nasal cavity. The author believes that when the operation is done entirely intranasally, curettment of the sinus cavity is not thorough enough to effect a cure, diverticular cells in the depths of the frontal cavity often being missed.

[The methods recommended are those we usually follow, but only after intranasal methods have failed to give a satisfactory result. As a matter of fact, most patients with maxillary sinuitis recover after an

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(1) Laryngoscope, July, 1921.

intranasal operation which secures proper ventilation of the sinus. The curretting of the sinus is not necessary.—Ed.]

Operation on the Nasal Sinuses in Children. During the last three years L. W. Dean and M. Armstrong[2] have made a routine examination of the nasal sinuses of 1,108 infants and children under 14 years of age. Operative procedures on the sinuses themselves in children are not often indicated, the acute infections of these cavities usually disappearing of themselves. Those cases which are classed as chronic empyemas yield much more readily than in the adult to non-operative procedures; due to two things: first, the age of the patient excludes long chronicity; second, nasal obstructive lesions at this age are not common.

The authors found a rather large number of chronic empyemas in their series, most of which were apparently cured by the removal of diseased tonsils and adenoids; 80 per cent. of their cases had this favorable termination. The hemolytic streptococcus infections are particularly resistant to treatment, but even some of these disappeared following the tonsil and adenoid operation without further operative treatment. Although cases associated with atrophic rhinitis and syphilis are not so beneficially influenced by this procedure, nevertheless, sinus disease in these cases rapidly improves with simple ventilation and drainage, together with proper local and general treatment. When treatment without operative procedure has failed, it is in only very rare instances that extensive operations are indicated. They should never be resorted to in children unless there is imperative need of the immediate removal of the infection, or if after months of treatment combined with the minor operative procedures for ventilation and drainage a marked chronic empyema persists.

While the pathology and systemic complications are

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(2) Laryngoscope, May, 1921.

the principal factors in determining the need of these extensive operations, the size of the sinus in influencing the pathologic changes is an important factor. This information regarding their size is secured by the *x*-ray. However, as a diagnostic procedure in children, the *x*-ray examination is not accurate. In 197 cases in children with blurred antra, the authors found only eighty-one to be diseased on culture.

The authors report in detail three very instructive cases in which after treatment of the nasal sinus disease, together with ventilation and drainage of the sinuses when indicated, the systemic infection was not controlled, and radical operations were performed. All three patients were suffering from severe arthritis, and the results obtained fully justified, in the minds of the authors, the procedures adopted. The hemolytic streptococcus was isolated in each case.

[The skiagraph as a means of diagnosing sinus diseases in early childhood is not so reliable as it is in adults. For obvious reasons it is the maxillary sinuitis which chiefly concerns us in children. The absence of the intractable chronic case in childhood may be due largely to the fact that this condition in adults is usually caused by dental disease which, of course, is not possible in childhood.—Ed.]

Accessory Sinus Disease Causing Blindness. There has recently been much just criticism of the unwarranted opening of accessory sinuses in loss of vision due to intracranial lesions. Leon E. White[3] believes there is danger that the pendulum will swing too far the other way and that an operative procedure of the utmost benefit in suitable cases will be discredited. A careful differential diagnosis must be made in every case, but in the subacute and chronic forms it is of the utmost importance to rule out central lesions and toxic infections. With these ruled out, the author believes that prompt surgical interference in the posterior sinuses,

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(3) Laryngoscope, August, 1921.

bringing about free ventilation, is highly essential. The size and position of the middle and superior turbinates determine largely the question of recovery with or without operation; and when they are found to be blocking the ventilation of the posterior sinuses they should be removed. The opening of the posterior ethmoidal cells and the sphenoid sinus is indicated in some cases, even with negative nasal findings, for often pathology is present, but can not be detected on examination, either by inspection or by the *x*-ray. The author reports very marked and rapid improvement following this procedure, all other causes of blindness having previously been excluded.

The operative procedures in these cases should not be any more radical than necessary. Simple drainage of the sphenoid and posterior ethmoid, without interference with the lining of these cavities, and the establishment of better ventilation by correcting a deflected septum or removing a portion of the middle turbinate, if necessary, is usually all that is required.

[A very timely discussion. Indiscriminate operating on the nasal sinuses is the natural result of teaching operative technique to men who have not been properly trained in the much more difficult field of making proper examinations and in recognizing the proper indications for surgical interference.—Ed.]

Aëration of the Posterior Accessory Sinuses in Acute Optic Neuritis. It is well established that disease of the paranasal sinuses may lead to an optic neuritis and even to blindness; consequently it is highly essential that the intimate anatomic relationship between the sinuses and optic nerve be thoroughly understood by both rhinologists and ophthalmologists. L. E. White[4] emphasizes the fact that a very thorough and careful nasal examination is often required to detect interference with aëration of the posterior accessory sinuses which may be playing an important rôle in the etiology of acute

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(4) Laryngoscope, May, 1922.

optic neuritis. The optic nerve is only in close relationship to the sphenoidal and posterior ethmoidal cell, so it is in this region that involvement is most likely to occur. Roentgenograms are usually disappointing; for, although purulent infections may account for a few of these conditions, there are many in which the infection is non-suppurative. Poor ventilation and faulty drainage are important predisposing factors. The size and position of the middle and superior turbinates play an important part in the aëration of the posterior sinuses, the simple removal of a portion of a large, congested middle turbinal which is causing pressure often relieving the entire condition.

The irritation of the optic nerve may be from direct extension of the infection by continuity of structure, from toxins originating in the sinuses, from microörganisms which may be carried in the blood or lymph channels from the sinuses to the nerve, from hyperplasia of the nasal structures interfering with aëration of the sinuses, and sometimes from anaphylaxis, as in asthma or hay fever, which may produce an engorgement about the optic nerve.

The author states that the important thing in the treatment is to establish aëration, and not to remove diseased tissue. Some patients will recover under local treatment while in others semiradical procedures are advocated.

Anatomic Relationship Between the Sphenoidal Sinus and the Temporal Lobe. It is generally supposed that a suppurative process in the sphenoidal sinus seldom gives rise to a cerebral abscess. J. Parsons Schaeffer[5] believes that in a majority of those cases of so-called primary cerebral abscess, the original source of infection may be traced to a suppuration in the sphenoidal sinus. It is generally believed that the only direct lateral relation of this sinus is the dural cavernous sinus and its contained structures. However, the

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(5) Jour. Amer. Med. Ass'n., May 28, 1921.

sphenoidal sinuses vary greatly in size and shape, owing to the varying degree of pneumatization which takes place. This often involves the entire sphenoidal body, even extending into outlying portions of the sphenoid and into neighboring bones. Asymmetry of the sinuses is the rule, many recesses and diverticula often invading its walls.

The important point which the author wishes to make is regarding the extension of the sinus sufficiently far into the great wing of the sphenoid beneath and lateral to the dural cavernous sinus to come into relationship with the temporal lobe of the brain. It may invade the great wing even beyond the point of the large foramina. In such cases, the sinus and the temporal lobe are so intimately related topographically that one can not ignore the sphenoidal sinus as a possible factor in temporal lobe abscess.

[The contributions of Schaeffer to our knowledge of the anatomy of the nasal sinuses have been most helpful.—Ed.]

Nasal Sinus Infection as a Causal Factor in Appendicitis. In reviewing and analyzing the cases of definite infective nasal sinuitis occuring in his private practice during two years, P. Watson-Williams[6] finds that he had ninety such cases and fourteen, or 15.5 per cent. of these had undergone appendectomy. Cases in which symptoms of appendicitis were reported were excluded unless appendectomy was performed. In some of these fourteen cases the length of time between the appendix operation and the recognition of the sinus infection was too long to justify the assumption of a causal interdependence. A chronic nasal sinuitis often has a very prolonged latent period of infectivity with practically no symptoms, then will suddenly break forth as an acute exacerbation. It is unlikely that an acute suppurative sinuitis will cause appendicitis, the gastro-

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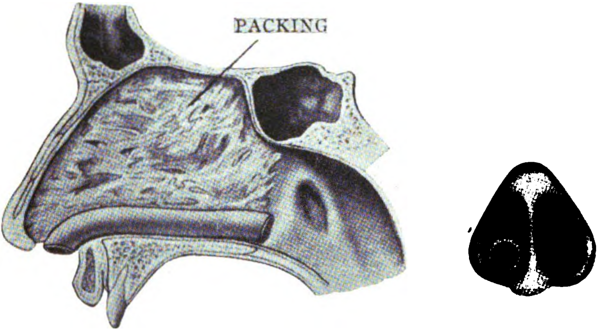
(6) Practitioner, April, 1921.

PLATE XXVI.



Hollow tube in place following submucous resection of section.—Goodyear, page 345.

intestinal tract being more prone to succumb to a chronic infection.

This element of chronicity is also equally important as regards appendicitis, as it seems probable that an acute appendicitis is usually only an acute exacerbation of a previous latent infection with a relatively long prodromal period. Hence, in collecting statistics, it is impossible to draw a line and assume that because the appendix infection culminated long before the chronic sinus infection declared itself by severe clinical manifestations, their interdependence must be ignored.

In two of the fourteen cases of appendectomy the patients were also operated on for duodenal ulcers, while of those not included in the appendix group, there were also among the series of ninety cases, two cases of gastric ulcer and several others with a history of colitis and gastric catarrah.

The author believes that nasal sinus infections have become far more prevalent since influenza has been endemic, following the epidemic of 1890; and he suggests that the relative frequency of appendicitis and of operation for its relief is not due to increased diagnostic acumen so much as to the greater frequency of the lesion since the onset of influenza.

[This contribution is quite in keeping with the clinical observation that infection of the appendix may be caused by infection of the faucial tonsils. The cases in which the appendix involvement follows acute tonsillitis are the most convincing.—Ed.]

Hyperplastic Non-Suppurative Sinuitis. According to B. M. Dickinson,[7] this phase of sinus disease coincides very closely in symptomatology with the latent suppurative type, but pathogenically and in the surgical aspect it is quite different. In frequency it ranks near or even higher than the suppurative form, but its chronicity and unobstrusiveness allow it to go to a large extent unrecognized.

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(7) Penn. Med. Jour., May, 1921.

The diagnosis is naturally more difficult than in cases of suppurative sinus disease, and a very careful study of the case together with the co-operation of the patient is necessary to arrive at a correct diagnosis. This latter factor is often difficult to obtain for the symptoms are sometimes very indefinite, often being more constitutional than nasal. Consequently, the coöperation between the internist and rhinologist is of great value in these cases. It is usually through the internist that these patients reach the rhinologist. Many of Dickinson's cases were first suspected and oftentimes definitely diagnosed by the ophthalmologist, for the patients frequently refer their symptoms to the eyes. Glasses that gave comfort and relief last month may now be useless. Headaches, with congestion of the conjunctiva and retina, together with muscular unbalance and asthenopia are highly suggestive symptoms. Nasal examination usually reveals some deflection of the septum and interorbital pressure. The mucous membrane is thickened and congested, and there are usually evidences of delayed drainage; but no secretion is observed.

The *x*-ray and transillumination are of little value in diagnosis. A small amount of grayish mucous secretion may be revealed on suction. Little change is produced in the mucous membrane by the use of adrenalin. The use of the probe reveals a rather thick, tough, spongy submucosa, especially in the posterior part of the nose. The prognosis depends upon the pathologic changes and the duration of the condition.

It is extremely important to have the patient continue the services of a first-class medical man, for a thorough understanding of the general health is highly essential in the treatment. Early attention will give relief usually without operation on the sinuses at all, while a deflected septum or other obstruction often requires surgical attention.

Cases classify themselves for treatment according to the degree of interference required: (1) those requiring in addition to medical treatment only local treatment; (2) those requiring medical treatment and the surgical relief of obstruction; (3) those requiring operative treatment of the sinuses themselves. The aim should be to leave the nose open and free for respiration and drainage, but the sinus work should be limited to the particular sinuses involved. The author finds that the anterior ethmoidal cells are nearly always the point of invasion and the infection spreads upward and backward. Frequently, however, the process begins in the sphenoid or posterior ethmoidal cells. The essential hyperplastic process is limited usually to the sphenoid and ethmoid sinuses and the turbinates. The frontal and maxillary sinuses are rarely affected except by interference with their natural drainage.

[For obvious reasons it is very difficult to obtain convincing evidence of this type of sinus trouble. This condition should be subjected to a most careful investigation. Its proper handling is palpably more difficult than is the proper care of the suppurative form of sinus disease.—Ed.]

Zinc Ionization in Treatment of Suppurative Sinuitis. A. R. Friel[8] has used to a considerable extent the ionization of zinc sulphate solution in the ear and various sinuses to clear up chronic suppurative conditions. In any sinus case the posterior choana is tightly closed with an inflated balloon. This converts the nose into a well when the patient is lying down and it is easy to keep a sinus full of fluid after it has been filled. It also prevents the patient from swallowing a large quantity of the solution.

The sinus is washed free from all pus with normal saline solution, then the solution containing zinc sulphate 75 grs., glycerine 2 oz., water to 70 oz. is introduced into the cavity through a small metal catheter. This catheter also serves to carry the electric current, a flexible wire being soldered to it. A current of from

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(8) Brit. Med. Jour., Sept. 10, 1921.

10 to 15 milliamperes for a quarter of an hour is usually ample. Excellent results are claimed for this method, one treatment usually being sufficient.

Extradural Abscess Complicating Acute Frontal Sinuitis. There are few reported cases of intracranial complications arising from acute frontal suppurations as compared to those of otitic origin. This is probably due, according to W. W. Perdue[1] to the fact that many are unrecognized until too late for surgical interference, and never go to autopsy for verification. Perdue reports a case with a complete recovery following drainage of the abscess.

The patient, a white man, aged 21, developed an acute left frontal sinuitis following a cold contracted while bathing. He was given hospital care for five days, at the end of which time he expressed himself as feeling perfectly normal. He resumed work two days later. Drainage had been free and was aided by an infraction of the middle turbinate. After working two days he began to complain of a dull pain over the left temporal region. The nose and sinuses were negative to examination. Four days later he developed total loss of speech. The temperature was 104° F. There was no paralysis or paresis of the right side. Within five hours from this time he was in a complete state of coma. The left frontal sinus was opened widely. It contained no pus, and with the exception of a thickened mucosa, appeared perfectly normal. No necrotic area leading into the cranial cavity could be found, so the posterior wall at the deepest point was broken through and over an ounce of thick pus immediately flowed into the sinus. The opening was enlarged and a drain inserted. Improvement was gradual, the patient regaining his health at the end of six weeks. The infection in this case must have advanced by way of the blood-stream or lymphatics. The author believes that early drainage of the frontal sinus might have averted the condition.

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(1) Southern Med. Jour., May, 1921.

Causes of Failure in Radical Frontal Sinus Operations. T. J. Harris[2] believes that the infrequency with which the radical external operation on the frontal sinus has been performed these past few years is due to the large number of failures which have resulted from it. These failures he believes to be due mainly to two things: reinfection of the cavity, and contraction of the nasofrontal duct. Failures in the Killian operation are due to re-infection, the result of incomplete obliteration of the sinus. This is usually dependent upon two causes: either failure to remove completely the diseased contents of the sinus or ethmoid, or the failure of the soft tissues to fill completely the sinus cavity as a result of the orbital roof which forms in part the floor of the sinus, as was intended by Killian. A direct consequence of this extensive destruction of the floor is the sinking inward of the outer wall of the nasofrontal canal resulting in pronounced narrowing, even to atresia, of the passage.

Harris strongly recommends the Lothrop operation in that it preserves the function of the sinus and at the same time establishes a permanent large opening through the nasofrontal duct. The importance of giving particular attention to the curetting of the external and internal angles of the sinus is to be borne in mind. Operative procedures which tend to secure drainage and ventilation are much preferred over those which tend to bring about obliteration. While the intranasal method has been much recommended, the fact that it must be performed without ocular inspection, and further, that the tendency in this type of operation is for the nasofrontal canal to narrow or close up is sufficient to recommend the combined internal and external method of Lothrop in place of it.

[The external operation has been largely given up for the reason that careful intranasal work usually gives satisfactory results and this without any disfiguring

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(2) Jour. Amer. Med. Ass'n., Oct. 8, 1921.

scar. It is only when menacing symptoms persist after the completion of careful intranasal work that one is called upon to resort to an external operation. When, particularly, the symptom of pain persists after completion of the intranasal work the external operation is to be considered. A continuation of discharge with an absence of symptoms of retention is not in itself a positive indication for the external operation.—Ed.]

A New Method and Instrument for Endoscopic Examination of Maxillary Antrum. It is well known that the *x*-ray, transillumination, and antral lavage all have their limitations in diagnosing the existing condition in the maxillary antrum. In view of this fact, H. L. Baum[3] has devised a new instrument for the endoscopic examination of the antrum through the canine fossa (Fig. 21). The instrument consists of a hollow cannula of about 4 mm. inside diameter and 9 cm. long, with a stout, very sharp trocar made to screw into the cannula

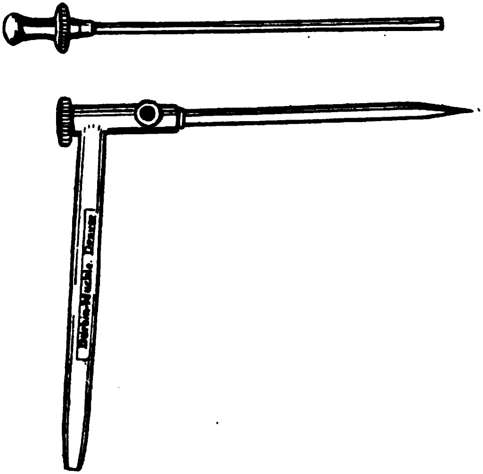

Fig. 21.—New instrument for examination of maxillary sinus (Baum).

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[3] Laryngoscope, December, 1921.

so that when assembled they fit together tightly as one instrument. A light, but strong handle is attached to the cannula. Removal of the trocar permits a Holmes nasopharyngoscope to be introduced through the cannula into the cavity. In addition, a smaller cannula has been made which fits into the outer as does the trocar, for the purpose of irrigation, the fluid going in through the small inner cannula and returning around it through the outer.

The procedure is carried out ordinarily under local anesthesia. The solution is injected under the mucosa above the alveolus in the canine fossa and close to the bone of the anterior antral wall. Blocking of the infraorbital nerve is not necessary. The instrument is then forced through the canine fossa into the antrum. The trocar is removed and the nasopharyngoscope is introduced. The cannula may be rotated about in order to give a more comprehensive view of the cavity. The instrument may be passed through the inferior meatus of the nose, but the author believes a better view is allowed by the above-mentioned route.

Empyema of the Antrum of Highmore Secondary to Extraction of Teeth. The most common cause for infection of the antrum of Highmore secondary to the extraction of teeth is, according to H. R. Lyons,[4] the penetration of the wall and lining of the antrum during the extraction of the tooth. Openings may be torn into the antrum from the rocking movement of extraction or during attempts at removal of root fragments by forcing the fragments through the antrum wall in an attempt to grasp it with the forceps. In a few cases the dental roots lie within the antrum, and, by their extraction, establish an avenue of infection from the mouth through the fistula thus produced. There are also a few cases in which the root extends to and not through, the periosteum and mucosa of the antrum, and after extraction of the root the soft tissues become

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(4) Jour. Amer. Med. Ass'n., Feb. 18, 1922.

infected and suppurate, and a probe inserted for diagnostic purposes accidently penetrates into the cavity of the antrum. The tendency of fistulous tracts is to close early; but, if they are allowed to remain open, or are kept open by packing, rubber tubes, etc., they become lined by epithelium, and a permanent fistula, which can not be eliminated by simple curettment, is the result. It is, therefore, an important surgical principle to use measures early which will aid in closing the tract. Food being forced continually into such an opening markedly retards the immediate healing of the wound, consequently it is important to close these passages with sutures.

The author made a study of 100 cases of this condition and found the average duration of the infections with fistulas was 349 days, the shortest being three days and the longest ten years. The average time of treatment before the patient came to the clinic was 170 days, the treatment consisting mainly of irrigations through the fistulous opening and packing.

The treatment of these cases depends on the duration of the infection, its previous treatment and the amount of alveolar necrosis. In acute and subacute cases the majority clear up with a modified Krause window-resection in the inferior meatus, and suction and occasional lavage through this opening. The fistula should be curetted gently and sutured. Lavage should not be too frequent as it may water-log the membrane. In chronic cases practically the same procedure is carried out. In protracted cases in which treatment is resisted, a radical external operation on the antrum, with excision of the fistulous tract and radical plastic closure, may be necessary.

Aspergillus of the Maxillary Sinus. This rare case, reported by R. H. Skillern,[5] occurred in a man, aged 50 years, who presented himself with vague symptoms referred to the left maxillary sinus. He had some uni-

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(5) Laryngoscope, December, 1921.

lateral, apparently non-fetid discharge from the nose, a feeling of fullness over the left antrum and vague head pains, entirely atypical of sinuitis. There were no periods of congestion or depression and no post-nasal discharge.

Examination revealed a slightly congested lateral nasal wall, otherwise normal. A needle puncture of the maxillary sinus was made and considerable resistance was offered to the ingress of normal saline solution. This resistance continued throughout the injection of the first syringe-full of solution, when it gradually lessened and some fluid began to appear from the nostril on that side. It appeared slightly turbid, but no free pus was observed. After the injection of at least 16 oz. of fluid, some small white inspissated masses resembling cottage cheese appeared in the washings. Continued lavage, which by this time was returning freely, brought forth a considerable quantity of this cheesy material. Lavage was continued until the antrum was free, the injected fluid returning clear. The patient at once expressed himself as greatly relieved, saying his head felt lighter than it had for a long time. He did not return for nearly a week, when further needle puncture and lavage were negative, the patient feeling quite well. He was to report if any of his old symptoms reappeared, but as several months elapsed without his return, he was apparently cured.

The specimen was studied histologically but not bacteriologically. It was reported as consisting of a close mycelial network with an occasional conidiaphore surmounted by a fan-like arrangement of conidiaphores. The hyphae take a faint pink stain (H. and E.), but the fructifying bodies are yellowish in color, apparently resisting the penetration of the dye. Diagnosis: *Aspergillus* probably of the species *A. fumigatus.*

While infection of the middle ear by the various forms of the aspergillus is comparatively common, an infection of the accessory sinuses is quite rare, as but four authentic cases have hitherto been recorded. All of these occurred in women and the infection was the *Aspergillus fumigatus.* The author believes that the rapid disappearance of the infection in his case was due to the fact that it was a recent one uncomplicated by any form of purulent process.

Polypoid Degeneration of the Lining of the Maxillary Antrum. The one pathologic condition of the nose that has been most closely associated with asthma and hay fever is a polypoid degeneration of the mucous membrane of the middle turbinate. This is usually assumed to be secondary to a suppurative ethmoiditis. As the purulent process subsides there is supposedly left a low-grade infection of the lining membrane which becomes the seat of a degenerative polypoid process. F. P. Emerson[6] believes that in every case of polypoid degeneration of the ethmoid labrynth, operative interference should always be followed by inspection of the antrum on that side. Several of his recent cases indicate that there is a close relationship between pathologic conditions of the antrum and hay fever and asthma. The findings in these cases also show a relation of this antral pathology to that found in polypoid ethmoiditis; the lining membrane of the antrum apparently undergoing the same changes as take place in the middle fossa. This relationship is not present in every case but the author believes it far commoner than has heretofore been suspected.

The diagnosis in these cases is difficult, owing to the fact that no pus is present. There has also been a secondary atrophy of the lining membrane so that transillumination and x-ray may be of no help. In one of the author's cases the polypoid mass was in the antrum and the middle turbinal body appeared perfectly normal. The discharge may be of no help as the antrum may be empty or contain a colorless serum. Gelatinous material can sometimes be washed out which is of considerable

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(6) Laryngoscope, May, 1921.

diagnostic value. The natural opening is usually more free than normal. The case must be diagnosed partly by exclusion, partly by the history of persistent head colds with a different feeling in one antrum from that of the opposite side, the presence of gelatinous masses, a cloudy *x*-ray, etc. The cases must usually be studied over a considerable time.

The only effective treatment is the removal of all diseased tissue; a radical operation being resorted to.

[The nasal condition most frequently associated with asthma is the condition known as hyperplastic ethmoiditis from which polypi develop. It is not primarily a suppurative process. Where a suppurative ethmoiditis occurs it is the result of a secondary infection, for the hyperplastic ethmoiditis in a non-suppurative process.

Polypoid degeneration of the mucous membrane lining the antrum is no contra-indication for the conservative treating by means of a large intranasal opening obtained by a resection of the nasal wall either in the middle or the inferior meatus. The free ventilation of the sinus obtained by this procedure is capable of doing the same for the regeneration of the membrane lining the sinus as does the resection of the concha media for the hyperplastic condition of the ethmoid labyrinth.—Ed.]

Thiersch Grafts in Treatment of Maxillary Sinuitis. F. N. Smith,[7] in giving a *résumé* of the etiology, pathology, diagnosis and treatment of maxillary sinuitis, reports the successful use of Thiersch grafts as a lining for the antrum in old chronic cases in which large areas or the entire mucosa require removal. The cases of bone involvement and marked polypoid changes demand radical surgery of some type, and in all of the various radical operations commonly performed on the antrum, healing is slow, dressings are more or less painful, and loss of time for the patient is considerable. The technique described by the author consists in making an

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(7) Jour. Mich. State Med. Soc., April, 1922.

incision from the labial frenum to the second bicuspid tooth and uncovering the bone so that the pyriform opening, the junction of the anterior and nasal walls and the canine fossa are clearly in view. The soft attachments of the nostril and the mucosa on the nasal wall beneath the inferior turbinate are then elevated from the bone, and an opening, similar to that in the Denker procedure, is made in the canine fossa. The mesial bony wall beneath the lower turbinal attachment is then removed, as well as the angle of junction of the two plates from the floor to the roof. The diseased lining is removed and the cavity packed with adrenalin gauze, while two Thiersch grafts of proper size to line the entire defect are cut from the arm or thigh. The flap of mucosa from the lateral wall of the nose is now turned down on the floor of the antrum. The grafts are spread evenly over the dry bone and even pressure applied by a rubber balloon. This balloon is attached to the end of a rubber tube which is lead out through the nostril. The incision is closed with horse hair.

The balloon is left in place for three or four days. It is then deflated and removed. The antrum is gently irrigated with saline solution and dried with air every other day for five or six times. By this time desquamation of the skin is complete and a smooth skin covers the entire cavity. At the end of three months the skin presents a moist, pinkish white surface, resembling an anemic mucous membrane.

The author reports the use of this method of procedure in thirty-six cases, in thirty-two of which the patients were discharged at the end of three weeks or sooner with excellent results. Of the four failures, two were due to infection, one to loss of the grafts on about the eighth day, and one to an osteitis. One of the infected cases was the first case of the series and resulted from allowing the rubber tube of the balloon to lead out through the canine fossa instead of the nose. The author believes the patient and the surgeon have everything to gain and nothing to lose by this technique, for if the grafts are lost, the conditions and care are about the same as those following a Denker operation. No packing is required and the after-care is extremely simple.

Dental Infection Secondary to Acute Maxillary Sinuitis. However guilty the teeth may be in the causation of maxillary sinuitis, there are occasions when they are not only innocent, but actually the victims of a primary infection of the maxillary sinus, as shown by the three cases reported by J. A. Glassburg.[8]

When these patients were first examined they all had sound teeth as demonstrated by the combined findings of the dentist, roentgenologist and rhinologist. Each had a definitely diagnosed acute suppurative maxillary sinuitis, and each one neglected the proper treatment and developed another acute attack, at which time a recently developed dental infection was discovered in addition to the antrum infection already present. It is concluded that the pus found its way from the antrum to the teeth, in view of the fact that a close anatomic relationship exists between the two. It has been demonstrated by injection of the blood-vessels in this region that it is also possible for infection to travel by way of the circulation from the antrum to the teeth.

Ethmoid Suppuration. Surgery of the ethmoid labyrinth is, on the whole, too radical in the opinion of D. A. Campbell,[9] who believes that the treatment of ethmoid empyema should be conservative to the utmost limit, and carried out with the least possible destruction to all the lateral wall structures as well as to the labyrinth itself. He is quite firm in his belief that removal of the middle turbinate, and a ruthless attack on the ethmoid labyrinth is not good surgery and leaves a large denuded area of suppuration on the lateral nasal wall. Some of the cells of the labyrinth which were

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(8) Jour. Amer. Med. Ass'n., March 25, 1922.
(9) Jour. Mich. State Med. Soc., April, 1922.

probably before healthy have been broken into and destroyed; so that instead of possibly isolated infected cells, which, under favorable conditions, might have gone on to recovery, we have the complete labyrinth broken down and suppurating. Cicatrization occurs, forming bands of tissue from one shattered cell to another, causing cavities to form between the bands, which become filled with pus with no possible means of escape.

It is of the greatest importance to establish free nasal drainage in all ethmoid cases, by removing polypi, correcting deflections and malformations of the septum, resection of the anterior end of the middle turbinate if causing obstruction, etc. The author believes if this is done many cases of suppuration of the ethmoid labyrinth will clear up by conservative treatment, such as shrinkage, suction, and the application of medicinal remedies to reduce inflammation. A treatment extending over several months may be expected before results are produced.

In case radical measures become indicated, the method chosen should conform with the exact condition present and should be carried out with the least possible destruction of healthy tissue.

Uncontrollable Hemorrhage Following Ethmoid Exenteration. Dunbar Roy[1] reports a case which resulted fatally from uncontrollable hemorrhage following an intranasal exenteration of the ethmoid labyrinth. The patient, a strong healthy appearing young man of 18, complained of a profuse purulent discharge from both nasal cavities of several years' duration. He also suffered from severe headaches. Examination revealed a bilateral suppurating ethmoiditis with numerous polypi. The frontals and maxillaries were clear. An intranasal exenteration was done on the left side the next day and the patient apparently made an uneventful recovery. Four months following the first operation he returned

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(1) Ann. Otol., Rhinol. and Laryngol., December, 1921.

for an operation on the right side. The left side at this time appeared in excellent shape and headache on that side had entirely disappeared. The right side was operated on with the same care and thoroughness as the left and the patient got along nicely for about four days when he developed a hemorrhage from the right side. This was checked without even using a tampon. Three days later he developed another hemorrhage, very profuse, and was rushed to the hospital and the nasal cavities and postnasal space packed tightly. Horse serum was administered intravenously and morphia given hypodermically. The blood seemed to coagulate readily. The tampons were removed in about 36 hours and the nose seemed in very good condition. Two days later hemorrhage started again and packing was inserted, but upon its removal bleeding again started. The common carotid was ligated on the left and the nasal cavities thoroughly cleansed and repacked. No bleeding followed the removal of the packing this time and the patient seemed to be doing very well. Five days later he began to bleed from the incision in the neck. This kept up so profusely that he was again taken to the operating room in order to stop the hemorrhage surgically. He took but a few whiffs of gas when he stopped breathing. Death resulted in spite of the use of oxygen and artificial respiration. No autopsy was allowed but the neck incision was opened up and all of the neck muscles and fascia were undermined and an immense cavity found filled with clotted blood. This extended even up to the chin. The suture on the carotid was firm and there was complete ligation.

The author believes that evidently a slow bacteremia had been progressing for some time due to the absorption for years of pus from the ethmoid cells and this had undermined the coats of the blood-vessels as well as the integrity of other body tissues.

The Complete Spheno-Ethmoid Operation. The most important principle underlying this operation is, in the opinion of S. Yankauer,[2] its completeness. Whenever there is an indication to open a single ethmoid cell, all the cells should be opened at the first operation, from the infundibular cell to the sphenoid and from the supra-orbital cells to the cells of the bulla and uncinate process. It is impossible to open one group of cells and be sure one has not broken down the walls of adjacent groups. Besides, clinically, it is not possible to determine the exact number of cells involved in the suppuration, for a single anterior cell and a single posterior cell may be involved and the intermediate and surrounding cells be entirely healthy. The second principle is the necessity of carefully preserving the mucous membrane lining the interior of the cells. This prevents large irregular areas of scar tissue, which are covered with squamous epithelium and consequently exercise no function and offers but little resistence to subsequent infection. Even though the mucous membrane in the cells is diseased it should not be removed for it will soon return to normal after the cells are freely opened. Another reason for not removing the mucous membrane from the cells is because the dura of the cranial cavity and the periosteum of the orbit are in direct continuity with it by means of blood-vessels and nerves which pass through openings in the bony walls, and if this lining mucosa is forcibly torn out injuries are caused to these important structures through which infection can travel. Healing is also greatly delayed by the removal of this lining mucous membrane.

The operation consists of two parts: The first part is the operation itself, which is usually completed within an hour. The second part is the after-treatment, which is divided into two periods. The first period is the time taken for the wound to heal, which is usually about six weeks; the second is the time required for the com-

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(2) Laryngoscope, November, 1921.

plete restoration of the function of the nasal mucosa, this usually takes about one year.

When the upper part of the nasal septum is deviated toward the side of the operation, a resection of the septum is advisable as a preliminary procedure. When the disease is bilateral, with a deviated bony septum, the wider side is operated on first, then the septum is resected, and finally the other side is operated on. The first step in the operation is the complete removal of the middle turbinate, following which all the ethmoid and sphenoid cells are opened. This last procedure is accomplished entirely with punch forceps. These punch forceps should be exceedingly sharp so as not to tear the lining mucosa of the cells, but to cut it off sharply. The curette is never used, not even for opening into the cells, as it usually causes extensive damage to the mucous membrane. A thorough knowledge of the blood-supply of the parts is necessary, otherwise extensive hemorrhage may result.

After the operation the patient is put to bed, but the nose is never packed. After forty-eight hours the nose is douched twice daily with normal saline solution, followed by a spray of 4 per cent. solution of antipyrine. In case the granulations become exuberant a solution of 20 per cent. silver nitrate favors the growth of the epithelium. Occasionally during the course of the convalescence the mucous membrane, otherwise healthy in appearance, will be found dry and covered with crusts and flakes of dried mucus. This is due to a loss of function of the cilia. To restore the motility of the cilia, the author uses with excellent results a watery solution of menthol as a nasal douch two or three times a week. This solution is prepared by floating menthol crystals on the surface of distilled water contained in a separating funnel or in a bottle with the stop-cock near the bottom. After twenty-four hours the solution can be drawn off at the bottom. It is usually diluted ten times and in this strength it leaves a feeling of warmth in the nose for one or two hours. The author advises against allowing the patient to contract the habit of nose douching, and thus keeping it up long after the need therefor has ceased.

HAY FEVER AND ASTHMA.

Desensitization of Hay-Fever Patients with Specific Local Applications. It has been observed by M. Mackenzie[4] that there is a local exhaustion of cutaneous reactions in hay fever and asthma patients, and that this exhaustion contains a certain amount of specificity to certain proteins. Upon this observation of local desensitization he has based a local treatment of such patients. It was tried on a group of thirty-eight individuals with seasonal hay fever, there being in all reasonably certain evidence that the symptoms were dependent on hypersensitiveness to pollens. Pollen extracts were prepared from the various plants in question. These extracts were found to contain from 75 to 150 mg. of nitrogen per 100 c.c. and were standardized and made up in four different strengths containing respectively 0.01, 0.1, 1.0, and 10.0 mg. of nitrogen per 100 c.c.

The patients were divided into three groups in order to determine the effect of local application to the nasal mucosa. Eight were treated with subcutaneous injection alone, ten by local application alone, and twenty by both subcutaneous injections and local applications. For the local applications, the patient was given an ordinary nasal atomizer and instructed to spray the nasal passages night and morning, beginning with the weakest solution. The strength of the solution was gradually increased. It was soon evident that the reactivity of the nasal mucosa could be greatly diminished by the spray alone. Patients in whom the weakest solution caused attacks of hay fever, could, after a few treatments, use the strongest solution without any signs of the condition occurring. In some the tolerance was increased one thousand times.

While it was definitely determined that the reactivity

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(4) Jour. Amer. Med. Ass'n., March 18, 1922.

of the nasal mucosa of hay-fever patients may be markedly diminished by spraying the nose and throat with the specific pollen antigen, it was noted that the results were very similar to those from the patients treated subcutaneously; but less satisfactory than when a combination of the two methods was employed.

Protein Sensitization in Bronchial Asthma and Hay Fever. Specific protein treatment of bronchial asthma, believed by M. A. Ramirez[5] to be the most successful procedure, consists of treating or desensitizing the patient with those proteins to which the individual is found to be sensitive by the skin test. Bronchial asthma caused by animal emanation is successfully treated by subcutaneous inoculations of the offending protein. Before this can be done, however, skin tests must be made with varying dilutions of the particular protein in order to find out the initial therapeutic dose. The dose is gradually increased each week until the patient becomes absolutely desensitized as indicated by the skin test. This treatment is given in horse, cat and dog cases, but in those patients who are sensitive to feathers, wool, and the hair or fur of other animals, it is easier to avoid these substances than to treat the patient with their protein. Pollen asthmatics are tested and treated in the same way with subcutaneous inoculations, and the treatment should be given preceding the pollen season rather than during it. Patients who are sensitive to bacterial proteins are given subcutaneous inoculations with vaccines of that particular organism. In case of food proteins it is best to remove the offending foods from the diet rather than attempt to desensitize toward them.

In case of hay fever, the cutaneous tests are carried out in the same manner, not only for the various pollens, but for foods, epidermals, and bacteria. Many patients show multiple sensitization and the author is convinced that to obtain really satisfactory results, one must

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(5) New York Med. Jour., Sept. 21, 1921.

actively immunize against every pollen giving a definite reaction.

Pollen Extract Treatment of Hay Fever. Certain pollens, coming into contact with the sensitized mucous membrane of the nasal cavity, causes a local intoxication which results in irritation of the terminal nerve fibers, thus bringing on the symptoms of hay fever. The active principle in the pollen is an albuminous body which can be extracted from the pollen granules by salt solution. B. C. Gile[6] makes use of this fact in his intradermal tests for hay fever. Slight scarification of the skin is made on the anterior surface of the forearm with a sharp scalpel, care being taken that no blood is drawn. A drop of salt solution is placed upon the scarified area and a small portion of pure pollen placed on the salt solution and carefully worked into the open scarification. Although the dermal reaction may appear in a few minutes, it is best to allow the pollen to remain for an hour before washing it off. A careful record is kept of each variety of pollen used. The positive tests show the pollens to which the patient is susceptible and from them a vaccine of definite strength is made. The dose is noted in terms of the protein nitrogen content of the extract.

The prophylactic treatment of hay fever is exceedingly important and may be begun two or three months before the expected attack. The initial dose of pollen protein nitrogen is 0.0025 mg. and is gradually increased until 0.02 mg. are reached. The interval between injections is usually from five to seven days.

During an attack of hay fever the injections of pollen extract are given daily in ascending doses until relief is obtained. At this point the dose is usually 0.02 mg., although larger amounts may be given, and from then on the intervals between injections are gradually increased until they are given from five to seven days apart. If the injections are required oftener than every five days, the data upon which the diagnosis is based

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(6) New York Med. Jour., Sept. 21, 1921.

should be re-examined. If the symptoms persist an autogenous bacterial vaccine should be alternated with the pollen extract. The author reports excellent results in more than 80 per cent. of the cases treated by this method.

Treatment of Asthma by Patient's Own Blood. G. H. Wildish[7] reports from South Africa a series of nineteen cases of asthma treated by subcutaneous injections of the patient's own blood. His attention was directed to this method of treatment by the account of somewhat similar treatment used in cases of migraine. From 5 to 10 c.c. of the patient's blood are withdrawn into a paraffin-coated syringe and immediately injected subcutaneously into the patient's back. Of nineteen cases of asthma (seven in Europeans and twelve in natives) five patients were cured and fourteen improved. A second injection was given in some cases.

Tuberculin Treatment of Asthma and Hay Fever. The supposition that there exists some relation between a condition of increased sensitiveness to tuberculin and the intensity of allergic or anaphylactic reactions, and the knowledge that many cases of bronchial asthma must be considered as caused by allergic reactions, led W. Storm Van Leeuwen and H. Varekamp[8] to suppose that a similar relationship exists between bronchial asthma and sensitveness to tuberculin, as shown by the von Pirquet test. They had also noticed previously that certain cases of hay fever showed extremely strong von Pirquet reactions; and in one case in which an intradermal tuberculin test gave an enormously strong reaction, they observed a marked improvement in the patient the following day.

These considerations led the authors to apply the tuberculin treatment to asthma and hay fever cases. Of thirty-four cases of bronchial asthma, thirty gave a positive v. Pirquet test, and of four hay fever cases, two

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(7) Brit. Med. Jour., Oct. 15, 1921.
(8) Lancet, Dec. 31, 1921.

gave a positive test. All the patients giving a positive test were placed on tuberculin treatment. The tuberculin used was Koch's T. O. A. and all injections were given subcutaneously. Very low doses were used at the beginning, usually 1 c.c. of a 1 to 100,000 dilution, which gave no general reaction. At first the dose was increased with each injection, but it was found that the best results were obtained by the injection of small amounts throughout the course of treatment and that it is unwise to raise the dose very high in order to obtain an immunization.

Nearly all the patients suffered from acute attacks of asthma at the time of entering upon this treatment. These attacks usually disappeared for good after the first two or three tuberculin injections; sometimes they did not reappear after the first injection. As a rule patients were kept in bed until three days had elapsed since the last attack. During the next six days they were gradually allowed to get up and go out. The majority were able to leave the hospital in from ten to fourteen days after entrance. Not knowing how long the effect of the tuberculin would last, the injections were continued over two or three months, during the first weeks giving one injection a week and later one every other week. The associated bronchitis often had to be treated separately, autogenous sputum vaccines sometimes being required. Only one relapse had occurred up to the time of this report, the first case dating over a period of fifteen months, and the last over only two months.

Treatment of Hay Fever with Glycerolated Pollen Antigen. The unstableness and rapid deterioration of the aqueous pollen extract led R. O. Clock[9] to devise a more uniformly stable product. He extracted pollen by various methods and succeeded in preparing a stable pollen antigen by extracting the dried pollen in 66.66 per cent. glycerol and 33.33 per cent. saturated sodium

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(9) Jour. Med. Soc. New Jersey, March, 1922.

chloride solution. Such a glycerolated pollen antigen proved to be remarkably stable and more potent than that obtained by any other method of extraction. The author was also able accurately to standardize the antigen against anti-pollen serum, thus making it possible to establish a uniform and accurate dosage.

The scheme of dosage adopted consists of fifteen doses of a gradually increasing number of pollen units. The minimal toxic dose was first determined by the instillation into the conjunctival sac of one drop of the highest dilution of the antigen which would provoke a marked hyperemia. While this dilution varied in different patients, the highest dilution of ragweed pollen antigen which produced such a reaction was 1 to 375,000, or, expressed in units of pollen protein, three pollen units. Therefore for the initial dose of pollen antigen, one-half of the quantity of pollen protein which gives a characteristic opthalmic reaction is used. Subsequent doses are increased very gradually. It is administered subcutaneously, preferably in the area over the region of the deltoid muscle. Three treatments are given a week, thus taking five weeks for the fifteen doses. Best results will follow if prophylactic treatment with the antigen is begun about six weeks before the expected attack of hay fever, so that the treatment will be completed a few days before the date of the usual onset of the disease.

Very favorable results from this treatment are reported, not only by the author, but by many physicians from several different states, to whom clinical history blanks were sent by Clock asking for a report on their results.

OZENA.

Ozena and Its Relation to Tuberculosis. It has long been known that acid-fast bacilli are present in the secretions of the ozenatous nose but the significance of their presence is still a question of much controversy. F. H. Linthicum[1] reports the results from a rather extensive study in an effort to determine the relationship, if any, between ozena and tuberculosis. Reports of work done by many previous investigators would certainly indicate something more than a mere accidental association of the two diseases.

The author carried out a series of animal experiments on guinea-pigs. Crusts from ozena cases, in which the presence of acid-fast bacilli were demonstrated, were made into an emulsion and injected into guinea-pigs—3 c.c. into each animal—using two animals to each patient. The intraperitoneal method was used. A second group of animals was injected subcutaneously. No evidence of tuberculosis was found in either group; forcing the author to conclude, from the experiments, that the acid-fast bacillus found in the nasal secretions of ozena is not identical with the tubercle bacillus. These results, however, were contrary to those of earlier investigators, who reported positive tuberculosis findings in a small series of guinea-pigs inoculated subcutaneously with a similar emulsion.

A series of nine typical cases of ozena in which the acid-fast bacillus was demonstrated in the nasal secretions, was placed by the author on tuberculin therapy. The dose was gradually increased until at the end of a year the patients received 1,000 mg. each month. The results were extremely gratifying; very marked improvement occuring in many of the cases at the end of three months; that is, a very noticeable decrease in the odor and in the formation of crusts.

It is noteworthy that one patient showed an initial improvement after five months, then four months later developed pulmonary tuberculosis while under observation. In none of the cases was the atrophy of the nose affected. The author believes that these results, together

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(1) Amer. Jour. Med. Sci., August, 1921.

with those of other workers, certainly warrant a more extensive trial of this form of therapy.

Treatment of Ozena with Scarlet Red Emulsion. J. C. Scal[2] reports the use of scarlet red emulsion in the treatment of atrophic rhinitis. Attempts were made at this mode of treatment by Jacobs, in 1913, but at that time it was impossible to get a proper emulsion. Such a preparation, having quince seed as its base, is now available, and is found to adhere closely to the mucous membrane in spite of the secretion. The water-soluble scarlet red (Biebrich ozo-benzine) is used. Its action is based on its antiseptic quality as a dye preventing bacterial growth, thereby removing the fetid odor, and restoring the glandular function by stimulating cell proliferation.

The patient is directed to douche or spray the nose with an alkaline solution, then apply a 4 per cent. scarlet red emulsion to all parts of the nasal mucous membrane, and at the same time massage it gently with the applicator. This forms a thick film of the emulsion. Applications should be renewed every forty-eight hours. Pronounced results must not be expected immediately, but the odor and crusts may be absent after the second application.

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(2) Laryngoscope, August, 1921.

DISEASES OF THE MOUTH.

Actinomycosis of the Tongue. Actinomycosis rarely occurs primarily in the tongue. Gordon B. New and Fred A. Figi[4] report three cases seen at the Mayo Clinic since October,1919. In that clinic in the last eleven years, 127 patients with actinomycosis were examined. In sixty-six the disease occurred in the head and neck, while in only three did it occur primarily in the tongue. It may occur in this location, however, by metastasis or by direct extension from involved contiguous structures. The disease occurs in adults; only one case has been reported in a patient under 20, a young man of 18. It is more commonly found in farmers or in persons whose rural life exposes them to infection, although it can not be said to be occupational. One of the author's patients was a judge who mentioned a habit of chewing bits of grass while playing golf.

The diagnosis must be based on the clinical picture and confirmed by microscopic examination. Aspiration of the contents of the suppurating nodule is usually unsatisfactory for often only a very few of the characteristic granules necessary for a positive diagnosis may be present within the nodule and unless these are obtained in the small specimen removed for microscopic examination it is impossible to make a diagnosis. The prognosis varies with the stage of the process and the clinical picture at the time of the patient's examination. It is favorable in those cases in which a small nodule is situated well forward near the tip of the tongue: less favorable in those in which there is a diffuse area, especially if it is near the base of the tongue, or

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(4) Amer. Jour. Med. Sci., April, 1922.

if there is a definite abscess. The treatment is surgical alone or both medical and surgical. Wide excision with primary suture of the wound is the treatment of choice if a discrete isolated nodule is present. If the abscess is too large for excision, drainage is advisable, with daily swabbing of the wound with tincture of iodine, packing with iodoform gauze, and the administration of large doses of potassium iodide, together with the use of radium, is believed to give the best results.

Circulation of Bacteria in the Mouth. In a study of the dissemination of bacteria in the upper air passages Arthur L. Bloomfield[5] first carried out a series of experiments to determine the mechanism of removal of charcoal particles placed on various areas of the mouth and throat. It was found that such particles were removed in a definite and orderly way, along direct paths leading back to the posterior tongue and esophagus. The experiments were then repeated in which bacteria were used as a test substance and similar findings were obtained. The sarcina lutea was used as it is absolutely non-pathogenic for human beings and the bright yellow colonies are easily identified in cultures. The organisms inoculated on various areas in the mouth and pharynx adhered at the site of inoculation and were not uniformly spread over the mouth cavity. Some transfer by direct contact took place, as from tongue to hard palate, etc. Aside from this limited spread by direct contact, the removal of the organisms was affected by a progression towards the esophagus, none of them coming forward in the mouth and none crossing the mid-line to the opposite side. The ingestion of a large glass of water following inoculation did not remove more than a very few of the organisms, and what were removed were swallowed and not reimplanted anywhere in the mouth or throat. After the subject had drank a heavy suspension of sarcina, relatively few organisms adhered to the mucous membranes.

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(5) Bull. Johns Hopkins Hosp., April, 1922.

These experiments show clearly that there is a definite mechanism whereby foreign organisms which enter the mouth are removed. Its essential feature is a direct and rapid transport of the bacteria towards the esophagus, where they are apparently swallowed.

DISEASES OF THE THROAT.

ADENOIDS AND TONSILS.

Grinding the Teeth a Symptom of Adenoid Growth. Grinding the teeth is said by C. E. Benjamin[1] to be the most important symptom of adenoid growth. It is of great value in diagnosing the presence of adenoids and may be the only symptom present. On the other hand, the condition is very rare in children not suffering from adenoids. The author has found it to disappear upon the removal of the adenoid growth in a large percentage of cases. Out of 271 children with adenoids in whom grinding the teeth was a common symptom, 219 were freed of the grinding following operation, twenty-four were improved and twenty-eight derived no benefit. The author believes that the condition should be considered as a reflex symptom, the receptive field for the reflex action being the nasopharyngeal mucosa, and the centripetal conductor being the glossopharyngeal nerve or the rami pharyngei of the sphenopalatine ganglion.

The Tonsils as Foci for Systemic Infection. G. E. Shambaugh[2] emphasizes the fact that the tonsils constitute the most important focus for systemic infection. It is highly important that the specialist be able to recognize tonsil infection and to know the various indications for the removal of the tonsils. The recognition of the relation between tonsil infection and systemic disease has brought about a veritable flood of needless indiscriminate operations in cases in which those who have been studying this subject recognize no real reason

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(1) Laryngoscope, March, 1922.
(2) Illinois Med. Jour., June, 1921.

for attributing trouble to these structures. The author believes that this indiscriminate operating on the tonsils has, no doubt, been the direct outcome of teaching internes and general practitioners the technique of tonsil operations, where these same practitioners have been unwilling or unable to devote that time and study to the subject necessary to acquire an adequate idea of the indications for these operations or to learn to recognize tonsil disease.

There are two types of tonsil infection: the acute and the chronic. Of these the acute tonsillitis is much more readily recognized, because it alone produces local throat symptoms. The chronic form produces, as a rule, no subjective symptoms, except as they may be complicated by attacks of the acute process. Many cases of acute sore throat have nothing to do with the tonsil, but are cases of acute pharyngitis, and it is highly important that these be differentiated before recommending removal of the tonsils. Of course, it is the milder form of tonsil infection that may be thus confused, and in order to make sure, it is well to have the patient return to the office when he is having an attack of sore throat. The author is convinced that these cases of milder tonsillitis are about as frequently the cause of systemic infection as are the more severe cases of acute follicular infection.

It is in the recognition of the cases of chronic tonsillitis that most of the mistakes have been made. Many of these cases are easily recognized, especially those in which the tonsils are distinctly enlarged, and the surrounding structures show a marked congestion, quite in contrast to the mucous membrane in the remainder of the pharynx, and where the crypts are filled with broken down cheesy deposits. Small submerged tonsils are very frequently the seat of a dangerous focus of chronic infection. It is not uncommon in such cases to discover a chronic abscess from which pus can be expressed, though the patient gives no history of having had a sore throat.

One form of chronic tonsillitis, and the one most frequently encountered, occurs in tonsils which are not appreciably enlarged and there is an absence of congestion, but in which an examination discloses the presence in the crypts of cheesy deposits. These cases are often wrongly referred to as having pus in the tonsils. It is this type of tonsil infection which requires the most careful considerations as to whether or not the structure should be removed. They are rarely a menace to the patient and the author believes that with the absence of a history of recurring attacks of acute tonsillitis, they should be left alone. However, if the patient is suffering from a serious form of systemic infection and a careful examination by a competent internist fails to discover and other likely focus, their removal is fully justified.

The practice of making cultures from the surface or from the crypts of tonsils has been shown to give us no information that can assist in deciding either for or against their removal.

Quantitative Bacteriology of the Tonsils. With the recognition of the tonsils as a source of infection in the body, the question of what sort of tonsils should be removed has become important. H. D. Caylor and G. F. Dick[8] have investigated the significance of the actual number of bacteria present in the interior of the tonsillar tissue as an index to the degree of pathologic change in the tonsil, and have attempted to determine whether or not tonsils with large numbers of bacteria per unit weight were more commonly associated with disease in other parts of the body than were those containing comparatively few bacteria.

Very careful technique was used throughout in order to avoid contamination. Small pieces of tonsil tissue of

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(8) Jour. Amer. Med. Ass'n., Feb. 25, 1922.

known weight were ground up in a sterile mortar, dilutions made of this up to 1 to 1,000,000 and cultured in blood-agar plates. After forty-eight hours of incubation, the colonies were counted with the aid of a hand lens, and the number of bacteria per gram of tonsil tissue was estimated. Gross pathologic descriptions of the tonsils and histologic descriptions of paraffin sections from the parts not used for culture were made.

It was found that the tonsils from patients who complained of recurring sore throat, or who had at the time of operation enlarged cervical glands, contained from two to twenty times as many bacteria per gram as did the tonsils from patients who did not complain of sore throat or have enlarged cervical glands. In four instances, the tonsils contained more than 16,000,000 bacteria per gram, and in three of these cases, the patients had some form of arthritis at the time of operation. No apparent relation between the number of bacteria per gram of tonsil tissue and the types of organisms predominating on the plates was found. Neither was there found any apparent relation between the types of bacteria and the clinical condition of the patients or pathologic condition of the tonsils. The tonsils which showed the highest bacterial content per unit weight were the relatively small tonsils in which chronic fibrous inflammatory changes had occurred. It was this type of tonsil which was associated with disease in other parts of the body. Large spongy tonsils rich in lymphoid tissue usually contained a smaller number of bacteria per gram and were less frequently accompanied by disease elsewhere than in the throat and cervical glands.

These findings indicate that tonsils should not be regarded as harmless because they are small. Pressure on the tonsil to ascertain whether or not pus can be expressed is often of no diagnostic value for it is often impossible to express pus from the smaller tonsils because the crypts are closed by fibrous tissue.

Relationship Between the Tonsils and Ductless Glands. G. Selfridge[4] believes that a rather close relationship exists between the tonsils and some of the ductless glands. He is of the opinion that any signs of dysfunction of the glands of internal secretion, as evidenced in the child and frequently in the parent, should have proper attention and medication before the child is rushed to the operating room for the removal of the tonsils and adenoids. This apparent gland dysfunction in many cases is sufficiently predominant and offers a satisfactory explanation for the many reinfections, colds, etc., seen in a large number of children, grouped under the so-called exudative diathesis. The lack of improvement in the condition of a child who comes within this group, following operation on the tonsils, may be attributed to this dysfunction of the ductless glands.

According to Leonard Williams, adenoids and enlarged tonsils occur in children who have an inadequate supply of thyroid secretion and the hypertrophic condition in each case is apparently the result of an endeavor on the part of an organism to supply an internal secretion as nearly allied as possible to the one that is lacking. On this theory is based the treatment consisting of the administration of thyroid extract, which causes the regression of the tonsils and adenoids. Experiments have been carried out by Otis with powdered dry tonsil of the calf and he suggests that the tonsils yield to the blood a hormone which influences the contractility of involuntary muscles (uterus), and also the blood-pressure, and possesses a powerful diuretic action.

The author suggests that the frequent, rather marked hypertrophy of other lymphoid structure in Waldeyer's ring, *i. e.,* lingual tonsil and lymphoid masses behind the posterior fancial pillars, following the removal of the tonsils, and the frequent filling in of the tonsillar spaces with lymphoid masses free from crypts, suggests

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(4) Ann. Otol., Rhinol. and Laryngol., June, 1921.

strongly Nature's effort to give to the economy a needed substance which surgery has removed; and the fact that the administration of minute doses of thyroid overcomes many of these symptoms lends support to this view. Instances are cited in which patients, especially those with vasomotor disturbances of the nose, were markedly improved by pituitary feeding.

Tuberculosis of the Tonsils. An extensive detailed study of the histopathology of tuberculosis of the tonsils has been made by C. V. Weller.[5] The material studied represents 8,697 cases, coming from all walks of life, varied geographical locations, all ages and the extremes of social standing. Microscopic sections were examined from both faucial tonsils in all cases and in about one-fourth of the cases the pharyngeal tonsil was examined as well. These sections were so oriented as to show in each the entire surface of a vertically bisected tonsil, and in case of the adenoid tissue the blocks were sliced away until the largest possible sections could be obtained.

The incidence of active tonsil tuberculosis in the series of cases studied, was found to be 2.35 per cent. As regards sex, it was found to be slightly more common in females than in males at practically all ages. In the series of 204 positive cases here reported, the range of age was from 2 to 59 years. The incidence in various age-groups depends largely on the character of the population from which the material is derived, the incidence being particularly high in institutions for the care of children, and among medical students, internes and nurses.

The author divides tonsil tuberculosis into three types: focal cryptic infections; ulcerative lupus-like lesions; and diffuse miliary tuberculosis. The first mentioned type is the most common, being usually unilateral, involving one or more crypt areas only, and avoiding the lymph follicles. Although some of these cases are auto-

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(5) Archiv. Int. Med., June, 1921.

infections in open respiratory tract tuberculosis, the majority must be considered cases of primary focal tonsil tuberculosis. The ulcerative lupus-like lesions result from the coalescence of crypt infections at the mouths of crypts or from direct extension from neighboring surfaces. The diffuse miliary type is usually a bilateral tonsil lesion, the tubercles being widely scattered and occuring almost exclusively in the follicles and germ centers. The author believes this type can best be explained as a hematogenous miliary dissemination. Mixed types may occur, as in patients with open pulmonary tuberculosis, in whom auto-infection may be associated with hematogenous miliary tuberculosis giving a combination of crypt infections with diffuse miliary tubercles.

Relation Between Diseased Tonsils and Cervical Adenitis. W. G. Haworth and S. R. Gloyne[6] report the findings from a histologic study of the tonsil in a series of 100 cases. Five per cent. of unhealthy tonsils associated with enlarged cervical glands contained histologic lesions of tuberculosis (giant cell system); 2 per cent. contained morphologically typical tubercle bacilli.

[It may be questioned whether giant cells found in the tissue surrounding a tonsil crypt containing the ordinary cheezy concretion should be taken as positive evidence of tuberculosis.—Ed.]

The Removal of Tonsils in the Presence of a Peritonsillar Abscess. The objections that are usually set forth against the removal of tonsils in the presence of a peritonsillar abscess are believed by J. Holinger[7] to be mainly imaginary. He lists the advantages of such a procedure as follows:

1. Peritonsillar abscesses often recur. Therefore sooner or later the tonsils have to be removed to pre-

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(6) Lancet, Nov. 12, 1921.
(7) Ann. Otol., Rhinol. and Laryngol., March, 1921.

vent recurrences, so why make two operations for what can be done in one?

2. The period of recovery after removal of the tonsils in the presence of an abscess is no longer than after removal without abscess.

3. In peritonsillar abscesses, multiple abscesses are often formed, necessitating repeated incising and long convalescence. Upon removing the tonsil all pockets are drained and healed at once.

4. Patients in a decidedly septic condition are relieved of their sepsis soon after the tonsils are removed.

There are some unusual features encountered in operating in the presence of an abscess. The anesthesia should be general as a local anesthetic is not satisfactory when injected into the inflamed, swollen, and tender tissues. The abscess may rupture during the anesthetic, before the operation is begun, in which case care must be taken to avoid aspiration of pus into the trachea. Suction should be used freely during the operation to remove the pus that is expelled during the enucleation of the tonsil. The parts are usually more or less distorted and the line of cleavage of the pillars is not always easily found at first sight. The tissues are very brittle and no cast-off lobe of the tonsil must be overlooked. Hemorrhage is often more profuse in this procedure but can usually be controlled by pressure with dry sponges. The after-care is not different from that after an ordinary tonsillectomy.

The author has followed this line of procedure for seven years with no bad results in any case.

[The necessity of employing a general anesthetic, the added risk from the inhalation of pus and the increased menace from bleeding all argue strongly against the removal of tonsils during an acute attack of peritonsillitis. To this must be added the additional risk of setting up a severe systemic infection, which occasionally follows the removal of the tonsils when they are not the seat of an acute reaction.—Ed.]

Effect of Small Doses of Roentgen-Rays on Hypertrophied Tonsils and Adenoids. It has been known for a number of years that lymphoid tissue is very susceptible to Roentgen-rays, more highly so than any of the structures of the body except the sex glands. By suitable exposures, it is possible to remove almost all of the lymphoid tissue without inducing detectable changes in other organs or tissues. J. B. Murphy, W. Witherbee, S. L. Craig, R. G. Hussy, and E. Sturm[9] make use of this fact in reducing hypertrophied and chronically infected tonsils and adenoids. They find that extensive reduction of lymphoid tissue can be induced by small doses of *x*-rays, well within the safety limit.

The individual to be treated is placed on a table with the head tilted so that the axis of the *x*-rays may pass under the angle of the jaw into the region of the tonsil. The area exposed on either side of the neck is about 3 inches square, the surrounding surface being covered with heavy sheet lead. The factors governing the dose of *x*-rays to each area was as follows: 8 inch spark gap measured between points; 5 milliamperes, 10 inches distance from the target to the highest point of skin exposed; the time varies from 3 to 7 minutes depending on the age of the individual. The *x*-rays were filtered through 3 mm. of aluminum. The approximate value of this dose is from one to one and three-quarters skin units. After an interval of a few weeks this treatment may, if necessary, be repeated with safety.

Bacteriologic examinations were made before the starting of treatment in all cases as well as several follow-up examinations in each case. Out of forty cases, thirty-six showed hemolytic organisms to be present before treatment. Of these, seven became negative one week after treatment, fourteen after two weeks, eight after three weeks, and one after four weeks, thus making a total of thirty cases out of thirty-six that became nega-

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(9) Jour. Exper. Med., June, 1921.

tive. The other six patients failed to return to the clinic and were lost trace of.

In general, it may be said that the reduction in the size of the tonsils and other lymphoid deposits in and behind the pillars of the fauces becomes clearly evident about two weeks after treatment and continues with increasing reduction for one or two months. As the tonsil shrinks, the crypts open and drain, and finally the edges become inverted and the surface grows smooth and healthy in appearance. The small lymphoid deposits in the pillars and the larger accumulations frequently found along the lateral bands of the pharynx disappear promptly after the treatment, and at the same time the injection of the vessels subsides.

Owing to its location, the adenoid tissue is very difficult to reach with the *x*-rays and the results have not been so good as with the tonsils. The authors directed the rays in through the back of the neck just below the posterior occipital region, with the head tilted forward.

[The shrinking of the tonsils frequently observed in adults so often associated with chronic tonsil infection has not been found to eliminate the infection. For this reason, it seems doubtful whether the shrinkage resulting from the *x*-ray will accomplish anything more for the elimination of the chronic infection. Small fibrous tonsils are as often the focus for systemic infection as are the hypertrophied tonsils. Bacteriologic examinations made from the surface or from the crypts have been shown to be of very little value in determining whether or not these structures are a menace. —Ed.]

Indications and Contraindications for Tonsillectomy. It is often a very difficult matter to decide whether to remove the tonsils or to leave them alone. No set rule can be laid down, each case requiring special painstaking, conscientious thought. The indications and contraindications for tonsillectomy as listed by S. Cohen[1] are as follows:

Absolute Indications:

1. Recurrent attacks of acute tonsillitis, whether of the suppurative or simple variety.
2. When an acute attack of tonsillitis is followed by such complications as rheumatism or heart trouble.
3. Tonsils that are so large as to cause any difficulty in breathing or swallowing.
4. All cases of acute suppurative otitis media (otorrhea) which have lasted more than six weeks.
5. Repeated attacks of pain in the ears of children who have a normal membrana tympani, and no near-by local condition is found to explain the pain.
6. Recurrent attacks of acute anterior cervical adenitis, especially when the "tonsillar gland" is involved.
7. Tonsils, which on pressure extrude cheesy matter or pus, complicated by symptoms of toxic absorption, or a foul odor of the patient's breath.
8. If the patient has had one attack of peritonsillar abscess, removal of the tonsils will prevent the recurrence of this condition.
9. Diphtheria carriers should have their tonsils removed.

Potential Indications:

1. All tonsils, being possible sources of trouble, should be looked upon with suspicion at all times, especially those showing some enlargement, irregularity, congestion, adherent pillars or extraneous substances obtainable by extraction or pressure. When such tonsils are present in patients suffering with rheumatism, chorea, arthritis, etc., and when all other sources of infection have first been investigated and treated without avail, they should be looked upon suspiciously, and if no contraindication exists, they should be removed.
2. In children with occasional nasal hemorrhage,

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(1) Med. Record, Feb. 25, 1922.

without any local area found to explain this, or individuals with chronic nasal discharge the adenoids and tonsils should be investigated with the idea of removal.

Contraindications:

1. Age: Tonsils should not be removed before the age of two years, unless some special indication exists. They should not be removed from people who have a marked arteriosclerosis, or in the old. The danger often over-balances the possible good that might result from such an operation.
2. Patients having a fever or who have albumin in the urine, should wait, if possible, until these symptoms disappear.
3. During an epidemic.
4. When vascular anomalies are seen or felt in the tonsillar region.
5. Hemophiliacs, or those known to bleed very much after the slightest cut, are endangered by a tonsil operation.
6. Operating during an acute attack of tonsillitis or of peritonsillar abscess, the author believes to be unwise.
7. All conditions wherein the giving of a general or local anesthetic is dangerous, unless the danger is over-balanced by the possible benefit to be derived.
8. Cases of atrophic rhinitis.
9. Syphilitics should not undergo tonsillectomy unless in the most extreme urgency.
10. Tonsillectomy in the presence of badly diseased teeth or of an acute infection in or about the mouth, should be avoided.

[The recognition of the proper indications for removal of the tonsils is much more difficult than is the technique of the operation. The wide-spread tendency for patients to be referred to the hospital for tonsil removal without the advice of a competent physician, but on the advice of the school teacher or visiting nurse must be stopped if we would remove the opprobium arising from the indiscriminate removal of the tonsils.

Of the above well thought out indications we would take exception to Nos. 4 and 5. Otitis media is often caused by adenoid or tonsil trouble, but when a careful examination fails to discover alterations in these structures we would hardly consider the occurrence of otitis media an indication for their removal.—Ed.]

Aspirating Dissector for Tonsil Surgery. The dissector devised by J. D. Thomson[3] is similar in form to the Yankauer separator, but is one inch longer. It is 8½ inches long and has a four mm. bore throughout, through which suction may be made. On the upper surface, 5 inches from the tip, is a counter opening which is controlled by the index finger. When closed, the beak opening is in action; when open, the beak opening is an abeyance (Fig. 22).

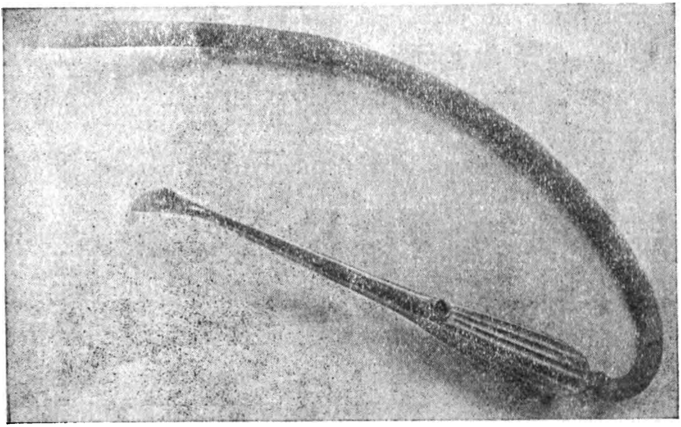

Fig. 22.—Aspirating dissector (Thomson).

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(3) Jour. Amer. Med. Ass'n., June 4, 1921.

PHARYNX AND TRACHEA.

Retropharyngeal Abscess. This condition is not nearly so rare as believed; its infrequency being due in many instances to the fact that it is not recognized by the physician. J. Friedman and S. D. Greenfield[4] have had a number of cases in which the complaints were far remote from the pharynx; two patients complained of pain in the ears and the condition had been diagnosed as middle-ear infections by the family physician. The diagnosis is rendered more difficult in children in whom the affection does not develop with an acute onset, there often being no pain or fever and the pus slowly collecting over a period of two or three weeks. The abscess may also be atypically located, being far down in the pharynx and hidden from view on ordinary examination.

The two varieties of retropharyngeal abscess are the acute or primary form and the chronic or secondary form. The former is the more common and is usually caused by the streptococcus, staphylococcus, or pneumococcus. The chronic type is usually accepted as being due to the tubercle bacilli, and originates primarily in the bodies of the cervical vertebrae.

In the author's series of sixty cases none was found in which the external swelling was of sufficient size to warrant the old distinction of so-called internal and external varieties. All their cases were of the acute or primary form. In two children, one aged 21 days and the other 17 months, a possible Potts' disease was suspected but both cleared up rapidly upon incision and drainage of the abscess.

The disease usually occurs within the first three years of life, although adults are not exempt. It consists in a suppuration of the retropharyngeal glands between the posterior pharyngeal wall and the cervical vertebrae;

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(4) New York Med. Jour., April 20, 1921.

and in practically all cases it is possible to trace the source of infection. Many are due to diseased tonsils and adenoids, some result from purulent rhinitis, and others follow the acute infectious diseases.

The treatment consists in early and adequate incision. No anesthetic is required, in fact it is usually contraindicated on account of the already greatly impaired respiratory channel. In the opinion of the authors there is absolutely no reason for draining these cases through an external incision.

Tracheal Diphtheria. Primary involvement of the trachea is comparatively rare in diphtheria and it is doubtful if it is at any time possible, in the absence of faucial lesions, to differentiate between the tracheal and laryngeal types. However, in the former, the voice may be unaffected. T. A. Lawder[5] reports a case of primary tracheal diphtheria that was not diagnosed definitely until tracheotomy was done. The operation did not give immediate relief, but it afforded later an easier way for the expulsion of the loosened membrane, which began to occur about fifteen hours later, due to the action of antitoxin; 30,000 units of antitoxin had been administered upon admission to the hospital, a few hours previous to the operation, as diphtheria was at once suspected.

Syphilis of the Trachea and Bronchi. P. M. Stimson[6] gives a *résumé* of the diagnostic features of syphilis of the trachea and bronchi, and reports three cases. He divides the syphilitic lesions of these structures, as does L. A. Conner, into four main types: (1) Gummatous swellings—circumscribed or diffuse; (2) ulcers—single or multiple; (3) endotracheal connective tissue new growths; (4) fibrous peritracheitis.

The affection has been found to be commonest in the fourth decade. The duration of the infection varies greatly—from nine months to forty-two years. The

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(5) Practitioner, May, 1921.
(6) Amer. Jour. Med. Sci., May, 1921.

lesions may be due to congenital syphilis. Syphilitic lesions of the trachea and bronchi are very rare. Symmers, in 4880 necropsies, found the existence of syphilis in 314 cases and in only four of these did he find lesions in the trachea or bronchi; that is, in slightly over 1 per cent. of the syphilitic cases and in less than one in 1,000 of all cases. On the other hand, Jackson states that of the specific inflammations that may cause tracheal stenosis, syphilis is the most common.

The symptoms are those of tracheal or bronchial obstruction. They may be divided into three stages, *viz.* irritation, permanent stenosis, and suffocating attacks. Cough is a prominent and usually the earliest symptom. It usually has a brassy, ringing quality. Sputum is often excessive and there may be more or less hemorrhage. Dyspnea is the most constant and conspicuous symptom. Pain is not often present.

Laryngeal obstruction must be ruled out by an examination of the larynx. A bronchoscopic examination should then be done and an actual view of the lesion obtained if possible. A small piece should be removed with bronchoscopic biting forceps for microscopic study. The blood Wassermann test, of course, should always be made.

Of the non-syphilitic causes of tracheobronchial stenosis to be ruled out, the more common are goiter, enlarged lymph glands as in tuberculosis or in Hodgkin's disease, thoracic aneurysm, neoplasms, etc. Foreign body in the trachei and bronchei must also be considered.

Treatment of Vincent's Angina with Copper Sulphate. C. R. King[8] reports excellent results in the treatment of Vincent's angina with sulphate of copper in 10 per cent. solution. It is simply applied daily to the ulcerated area with a cotton applicator. Many of the author's cases cleared up in four or five day's time. In those cases in which the disease breaks out anew in other parts of the mouth or throat, it is highly important to have the teeth thoroughly scaled and cleaned. With this dental prophylaxis in addition to the above treatment, it is very rare to see a relapse.

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(8) Laryngoscope, December, 1921.

The Symptomatology and Diagnosis of Foreign Bodies in the Air and Food Passages. C. Jackson[9] makes a detailed study of this subject based upon a series of 789 cases. He cites as an example of its importance the fact that the most frequent cause of the failure to diagnosticate foreign bodies in the lung is that the practitioner is misled by the almost total absence of symptoms during the first few days or weeks. For instance, a patient presented himself at the clinic who had aspirated a large double-pointed fence staple, but had had absolutely no symptoms until four weeks following the accident. He consulted his family physician at the time of the accident, who assured him that such a thing was impossible, as it would have caused death in five minutes.

The author summarizes the chief points in the symptomatology and diagnosis of foreign body in the air and food passages as follows:

In the Larynx:—

1. Foreign bodies lodged in the larynx cause an initial laryngeal spasm which is followed by more or less laryngeal wheezing, croupy cough, and a variable degree of impairment of phonation.
2. Pain in the laryngeal region may be present and is sometimes referred to the ears.
3. The larynx may tolerate a thin, flat foreign body for a relatively long period of time, but the development of increasing dyspnea renders early removal imperative in the majority of cases.

In the Trachea:—

1. Tracheal foreign bodies are usually movable and their movements can usually be felt by the patient.
2. The vibrations may be palpated and heard with the stethoscope.

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(9) Amer. Jour. Med. Sci., May, 1921.

3. Cough is usually present at once, may disappear for a time and recur, or may be continuous, and may be so violent as to induce vomiting.

4. Sudden shutting off of the expiratory blast and phonation during paroxysmal cough is almost pathognomonic of a movable tracheal foreign body.

5. Dyspnea is usually present and is due to the bulk of the foreign body plus the subglottic swelling caused by the traumatism of the shiftings of the intruder.

6. The asthmatoid wheeze is usually present and is often louder and of lower pitch than the asthmatoid wheeze of bronchial foreign bodies. It is heard at the mouth, not at the chest wall.

7. Pain is not a common symptom, but may occur and be accurately localized by the patient.

In the Bronchi:—(*a*) Early symptoms of irritating foreign body (such as a pea-nut kernel):

1. Initial laryngeal spasm is almost invariably present with foreign bodies of organic nature, such as nut kernels, peas, beans or maize.

2. A diffuse purulent laryngotracheo-bronchitis develops within twenty-four hours in children under two years.

3. Fever, toxemia, cyanosis, dyspnea and paroxysmal cough are promptly shown.

4. The child is unable to cough up the thick mucilaginous pus through the swollen larynx and may "drown in its own secretions" unless the offender be removed.

5. Lung abscess rapidly forms.

6. The older the child the less severe the reaction.

7. In the early stages an acute obstructive emphysema is present, manifested by limited expansion, muffled tympanitic percussion note, markedly diminished or absent breath sounds on the obstructed side, and many râles and harsh breathing on the free side.

8. The radiograph confirms these signs by showing greater transparency on the obstructed side, displacement of the heart toward the free side, depression and

limitation of the diaphragmatic movement on the obstructed side.

(*b*) Symptoms of prolonged foreign body sojourn in the bronchi:

1. The time of inhalation of a foreign body may be unknown or forgotten.
2. Cough and purulent expectoration ultimately result, although there may be a protracted delusive symptomless interval.
3. Periodic attacks of fever, with chills and sweats and followed by increased coughing and the expulsion of a large amount of purulent, usually more or less foul material are so nearly diagnostic of foreign body as to call for exclusion of this probability with the utmost care.
4. Emaciation, clubbing of the fingers and toes, night sweats, hemoptysis, in fact all of the symptoms of tuberculosis are in most cases simulated with exactitude, even to the gain in weight by an outdoor regimen.
5. Tubercle bacilli have never been found in the Bronchoscopic Clinic associated with foreign body in the bronchus. It was the only element lacking in a complete clinical picture of advanced tuberculosis. A point of difference was the rapid recovery after the removal of the foreign body.
6. The statement in many of the text-books that foreign body is followed by phthisis pulmonalis is erroneous.
7. The subjective sensation of pain may allow the patient to localize a foreign body accurately.
8. Foreign bodies of metallic or organic nature may cause their peculiar taste in the sputum.
9. Offensive odored sputum should always suggest bronchial foreign body; but absence of sputum, odorous or not, should not exclude foreign body.
10. Sudden complete obstruction of one main bronchus does not cause noticeable dyspnea provided its fellow is functionating.

11. The pleura is rarely involved. Rib resection done for supposed empyema has, with one exception, shown no pus.

12. The physical signs usually show limitation of expansion on the affected side, impairment of percussion, and lessened transmission or absence of breath sounds distal to the foreign body.

13. All cases of chest disease should have the benefit of a radiographic study to exclude bronchial foreign body as an etiologic factor.

14. Symptoms of pulmonary abscess, or other lung disease, even cough, following within a few weeks of the extraction of teeth, call for the exclusion of foreign body in the lung.

In the Esophagus:

1. There are no absolutely diagnostic symptoms of esophageal foreign body.

2. Dysphagia, however, is the most constant complaint, varying in degree with the size of the foreign body and the degree of inflammatory or spasmodic reaction produced.

3. Pain may be caused by the penetration of a sharp foreign body, by inflammation secondary thereto, by impaction of a large object, or by spasmodic closure of the hiatal sphincter.

4. The subjective sensation of foreign body is usually present but can not be relied upon as assuring the presence of a foreign body for it is present for a time after the passage of the intruder.

5. Fluoroscopic study of the swallowing function with barium mixture or capsule will give the location of a foreign body which may not be radiopaque.

6. Anterior-posterior and lateral roentgenograms should always be made.

7. The value of a radiograph after the removal of the foreign body can not be too strongly emphasized.

In the Stomach:—

Foreign body in the stomach ordinarily produces no symptoms. The roentgenogram and the fluoroscopic study with an opaque mixture are the chief means of diagnosis.

Removal of Bread Crumbs from Trachea by Suction. W. B. McWhorter[1] reports the successful removal of bread crumbs from the trachea of a child 10 months of age by suction. The child had inhaled the crumbs three days previous and had had constant labored breathing during this time. Direct laryngoscopic examination was impossible owing to vomiting and spasm of the larynx. Consequently ether was given and a 5 mm. bronchoscope passed. A large white mass was seen just below the vocal cords, almost completely blocking the lumen of the trachea. A small aspirating tube was passed through the bronchoscope and connected with an electrical suction apparatus. The entire mass was aspirated, as was another one at the bifurcation of the trachea. The masses were of doughy consistency. Relief was immediate and complete.

The Use of Heat Hyperemia in Esophageal Strictures. L. W. Dean[2] describes the use of electrically heated flexible esophageal bougies for dilating fibrous esophageal strictures. This method has hastened very much the dilating process. The action of the heat is not confined to the production only of heat hyperemia, but is used until an edema is produced.

A bougie is selected that will fit tightly the stricture, using a mouth gag to prevent the patient from biting the bougie. It is inserted tightly into the stricture. Before insertion the bougie is warmed to 40 degrees centigrade and is left in place for 30 minutes, remaining at a constant temperature during this time. When it is removed the stricture area is hyperemic; the fibrous tissue appears moist; it is edematous and softened. The dilitation is continued immediately after the removal of the heated bougie with non-heated flexible bougies.

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(1) Jour. Amer. Med. Ass'n., Dec. 31, 1921.
(2) Ann. Otol., Rhinol. and Laryngol., December, 1921.

Within the bougie is a radiator, the temperature of which is controlled by a light socket controller of the Wappler type. A thermometer is inserted into the current to indicate the temperature.

Pedunculated Lipoma of the Esophagus. This unusual case, reported by P. P. Vinson,[3] was in a man, aged 62, who came to the Mayo Clinic with the following history. Six years previously, upon coughing, there came into his mouth what seemed to be a small growth attached to the uvula. The growth was easily swallowed, but his throat felt sore for several days. He had no further trouble until three weeks before coming to the clinic for examination, when, following a heavy meal, he became nauseated, and in vomiting he ejected a piece of tissue long enough to protrude from his mouth. He became excited and tried to bite it off, but lack of teeth prevented this, so he again swallowed it. One week later the mass was regurgitated again. There was no dysphagia at any time.

Esophagoscopy showed a pedunculated tumor on the wall of the esophagus just below the introitus. The pedicle was 1 cm. in diameter. Vomiting was induced and the tumor regurgitated. It extended from the mouth 11.5 cm. beyond the incisor teeth. It was firm, covered with normal mucous membrane, and slightly ulcerated at the tip. On account of its high attachment it seemed best not to attempt to snare it off from within; so the esophagus was opened through an incision in the left side of the neck and the growth removed. Microscopic examination showed it to be a simple lipoma. Recovery was uneventful. The tumor is shown in Plate XXVII.

Foreign Body in the Esophagus Removed by External Esophagotomy. J. N. Roy[4] reports the successful removal of a foreign body from the esophagus by ex-

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(3) Jour. Amer. Med. Ass'n., March 18, 1922.
(4) Ann. Otol., Rhinol. and Laryngol., March, 1921.

ternal esophagotomy, following two unsuccessful attempts at removal by the ordinary direct methods.

A child 4 years of age was brought to the hospital with a history of having swallowed an iron washer thirteen months previously. He had at once complained of pain in the throat and a member of the family, in attempting to remove the washer with the finger, pushed it further down. There was no difficulty in breathing, but the child could not swallow solid foods. A physician who was consulted prescribed a purgative. During the next nine months nothing special was noted except a little constipation and some growing difficulty in swallowing. The child was taken to a hospital and an *x*-ray examination made, the foreign body being located above the clavicles. Chloroform was administered and a surgeon introduced a Kermisson hook into the esophagus, but all attempts at extraction were fruitless. He declared the instrument did not even touch the foreign body. An esophagoscopy was advised, but the mother wished to take the child home over the holidays, promising to return later. However, they did not return until after four months and the case was then seen by the author for the first time. A second radiograph showed the foreign body in the same position as before.

Esophagoscopy was performed under chloroform anesthesia. A huge accumulation of granulation tissue was found in the affected region, making it impossible to see the foreign body. A pair of forceps was introduced and by careful manipulation the iron washer was located in the granulations and dislodged. It was withdrawn for a distance of 4 cm. then became wedged again, its rough edges becoming imbedded in the esophageal wall. In order to avoid tearing the esophagus, no further attempts at removal were made.

A few days later, the esophagus was exposed through a left lateral incision along the median border of the sternocleidomastoid muscle, extending from the sternum to the cricoid cartilage. A bougie was introduced into the esophagus from above; it was then opened by a short incision near its posterior aspect and the washer removed. The esophageal incision was closed with catgut.

A Nélaton tube was introduced through the nose into the stomach through which the child was fed for two weeks. The recovery was uneventful.

Removal of Sand Spurs from the Upper Air Passages. The flora of a locality is an etiologic factor in foreign body lodgment, according to H. Marshall Taylor,[5] who reports a series of eighteen cases in which a sand spur was removed from the larynx and tracheobronchial tree. The sand spur, belonging to the family *Gramineae,* or grass family, is extremely common in certain localities, particularly in Florida, where this series occurred. The common name applied to these plants varies in different parts of the country, bur grass, sand bur, and cockspur being other names frequently applied.

In the author's series of eighteen cases all were in children less than 12 years old, except one which was in a woman aged 22. The youngest patient was aged 3. In sixteen of the cases the spurs were found to be located somewhere in the larynx, mainly in the anterior commissure; and in two they were in the right bronchus. Those individuals in whom the lodgment was in the larynx immediately developed aphonia and pain on swallowing. Some complained of pain referred to both ears. Four cases showed an increasing embarrassment of respiration and pending edema. Those cases in which the sand spur had been in the larynx for more than twenty-four hours presented a picture resembling laryngeal diphtheria. There was a dirty, grayish exudate elevated above the surrounding mucosa, and the adjacent tissues were inflamed and edematous. The temperature ranged from 100° to 102° F., and there was some cervical adenitis. This

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(5) Jour. Amer. Med. Ass'n., Aug. 27, 1921.

was attributed to the imbedding of the barbs and spines of the spur into the mucous membrane.

The history of getting the sand spur in the mouth, followed by a severe, brief laryngeal spasm, is an important factor in diagnosis. The *x*-ray is of little or no value in the localization of these foreign bodies.

Membranous Obstruction of the Bronchi Removed with the Bronchoscope. C. E. Purcell and J. B. Acree[6] report a case of diphtheria in a child 4 years old, in whom large casts and slugs of membrane were repeatedly removed from the bronchi by means of the bronchoscope. The child had been ill for a week without medical attention. Within thirty-six hours after the case was seen by the authors, a tracheotomy was required, which however gave only temporary relief. Breathing became more and more difficult, but upon looking through the tracheotomy wound the trachea was seen to be clear and free as far as the bifurcation. It was therefore concluded that the obstruction was in the bronchi and a bronchoscope was passed through the tracheotomy wound revealing a white, grayish membrane practically occluding each bronchus. This membranous obstruction was grasped with forceps and removed, giving instant relief to the patient. After about twelve hours the obstruction began to recur and a large amount of membrane was again removed by means of the bronchoscope. This procedure was repeated four times before relief became permanent. Diphtheria antitoxin was also administered in large doses. The tracheotomy tube was removed at the end of a week and the patient went on to a complete recovery.

The authors point out that the bronchoscope offers a new chance of relieving apparently hopeless cases of asphyxiation in children with tracheal or bronchial membranous obstruction.

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(6) Laryngoscope, September, 1921.

THE LARYNX

Cicatricial Laryngopharyngeal Diaphragm. G. B. New and P. P. Vinson[7] report an unusual case of cicatricial laryngopharyngeal diaphragm caused by swallowing lye. As a rule these cases are all syphilitic in origin, although Fleischman and Borchard have advanced the possibility that they may sometimes be due to diphtheria, lupus or other non-syphilitic ulcers.

The patient was a man, aged 28, who came to the clinic wearing a tracheotomy tube and a gastrostomy tube, being unable to swallow or breathe through the pharynx as a result of caustic burns two years previously. While walking in his sleep he drank a solution of lye, but immediately woke up and emptied most of the solution out of his mouth without swallowing. Breathing and swallowing gradually became more and more difficult and two months following the accident tracheotomy and gastrostomy were performed. For two years following this he continued to earn his living as manual training instructor in a high school.

Examination with a laryngeal mirror disclosed a scarred diaphragm joining the base of the tongue around the region of the epiglottis to the posterior pharyngeal wall. There was a very small opening just to the right of the mid-line, well posteriorly, that admitted a very small probe. Under laryngeal suspension a circular piece was removed with a knife. Two strictures in the esophagus about 20 cm. distance from the incisor teeth required repeated dilating. The man was then able to swallow any kind of food. Before being able to discard entirely the two tubes he developed pneumonia followed by empyema which necessitated draining, thus causing him to wear a third tube in his body. He soon discarded all of them and was dismissed from the hospital feeling perfectly well (Plate XXVIII).

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(7) Jour. Amer. Med. Ass'n., April 9, 1921.

Epiglottidectomy for Relief of Congenital Laryngeal Stridor. This operative procedure was performed by S. Iglauer[8] and it is believed by him to be the first time that the epiglottis has been removed for the relief of congenital laryngeal stridor. In these cases of stridor most observers have found an exaggeration of the infantile type of epiglottis. The infantile type is characterized by its soft non-resistant texture and by more or less approximation of its lateral edges and of the arytenoid-epiglottic folds, thus giving the epiglottis a peculiar trough or gutter-like shape. As the child grows, the epiglottis gradually becomes more rigid and elevated and tends to unfold, so that by the ninth year it begins to assume the adult type. An exaggeration of the infantile type is usually found in these cases, and upon examination can be seen to tilt backward during inspiration, while its lateral borders and aryfolds frequently come in contact. The upper aperture of the larynx may thus be reduced to a slit-like orifice with a rhomboid opening just anterior to the arytenoids. Iglauer thinks that the stridor is probably due to the vibrations of the aryfolds and the borders of the epiglottis. The onset is usually shortly after birth and is characterized by a peculiar inspiratory obstruction associated with a crowing sound. It usually disappears during the second year of life. Dyspnea is usually absent but there may be considerable inspiratory retraction of the lower thorax and at the sternal notch. In severe cases asphyxial attacks may occur and may at times be so severe as to cause death.

The case reported by the author was one in which difficulty in breathing was observed immediately following delivery. Marked inspiratory stridor and cyanosis were present. Dyspnea was constant and at times became paroxysmal, being increased by crying and nursing. There was an anxious facial expression, the eyeballs became prominent and there was extreme cyanosis.

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(8) Laryngoscope, January, 1922.

Artificial respiration was required at times. Direct examination of the larynx presented the picture described above, the epiglottis being very soft and flabby and closing like a book with each inspiration. The epiglottis was removed without anesthesia, the patient being suspended for the operation. The stridor gradually disappeared within a few days and no asphyxial attacks occurred following removal. Swallowing was normal at all times.

The author believes that since most observers agree that congenital stridor is due to a valve-like infolding of the epiglottis, it seems to be a rational procedure to remove it in all cases subject to asphyxial attacks.

Ventriculocordectomy. A new operation has been devised by Chevalier Jackson[10] for the cure of goitrous paralytic laryngeal stenosis. This form of stenosis is due solely to the paralysis. The patient has usually had a tracheotomy performed for urgent dyspnea and comes to the laryngologist for decannulation. The dyspnea is due mainly to the paralysis of the crico-arytenoidei postici, but the author points out another factor which he believes is of great importance; namely, a mechanical one, due to the shape of the ridge of tissue supporting the cord and forming the floor of the ventricle. The tapering shape of the subglottic airway encountered by the upward moving expiratory blast widens the flaccid glottic margins; whereas on inspiration, the flat floor of the ventricles is depressed, throwing the cordal edges together and thus tending to close the glottis tighter. Most of the cases of bilateral laryngeal paralysis that have presented themselves at the author's clinic have been caused by goiter. Very rarely has the paralysis been the result of thyroidectomy.

The three chief functions of the larynx are phonation, protection and expectoration. Any laryngeal operation proposed must be considered in its results on these three functions. The operation devised by the author

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(10) Archiv. Surg., March, 1922.

is ventriculocordectomy, in which the cord and the supporting tissue of the cord is removed. Both sides of the larynx are operated upon but at different times, one side being allowed to heal before removing the other. No anesthetic, local or general, is used in children. In adults cocaine solution is painted on with a swab and morphine gr. ¼ is given an hour before operation. The larynx is exposed with the direct laryngoscope and through it punch forceps are inserted. The ventricular band is elevated and the forceps applied as shown in the accompanying diagram. Thus the floor of the ventricle and part of the mucosa of its outer wall are removed at one clip. A clean cut is necessary. The tissues must not be hacked. No after treatment is necessary, although in some cases recurring granulations must be combatted. In all of the seven selected cases operated on by this method by the author, a voice louder than a whisper was obtained. In four the voice became loud enough to be heard across the room.

Suitable cases must be chosen for this operation. If success is expected it must be limited to cases totally free from cicatricial stenosis. Many of these patients have had previous tracheotomies and unfortunately they have often been high tracheotomies, thus resulting in cicatricial stenosis. It is also important to wait a year after the onset of the paralysis before interfering surgically with these cases, as function may return of its own accord.

Decannulation is accomplished by the author's system of corking. When the laryngeal airway seems ample, the partial corking of the cannula is commenced. Corks made of "pure cord" rubber and of suitable diameter should be obtained and ground off on one side with an emery wheel to permit leakage of air past the cork to the desired degree. It is best to start with a "half cork" and change from time to time with less and less by-passage space until a "whole cork" completely occluding the cannula, can be worn day and night. The cannula should not be abandoned until after the patient has been able to wear a "full cork" night and day for a month.

If in six months after decannulation, a fistula remains open and the laryngeal lumen is ample, the fistula may be closed by a plastic operation. There are many methods by which this may be done, but the one used by the author is very simple. The fistula is dissected free in tube-like form, drawn out, ligated close to the trachea and cut off to a very short stump which may be touched with pure phenol. The soft tissues are then drawn together over the stump with deep sutures and the skin wound closed without drainage.

Treatment of Multiple Papillomas of the Larynx in Children. The treatment of multiple papillomas of the larynx in children has always been difficult because of the tendency to recurrence, and the lack of uniformity of methods employed in the treatment emphasizes the fact that the results have not always been good. G. B. New[1] has examined at the Mayo Clinic in the past six years twenty-six children under 12 years of age with multiple papillomas of the larynx, the youngest being 10 months and the oldest 12 years. Such patients are usually brought to the clinic because of hoarseness and shortness of breath, which may have started at the age of 2 or 3 months as a slight wheezing or crowing cough; or the condition may not have been noticed until the child began to talk. The symptoms may not be observed until the child is 3 or 4 years of age, gradually progressing until he is not able to speak above a whisper. Emergency tracheotomies are frequently required.

The diagnosis of these cases can be made only by laryngoscopic examination. One of the author's patients had had six suspensions and the removal of the papillomas, but when he came to the clinic a large papillomatous mass stood up from the larynx and almost filled the

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(1) Ann. Otol., Rhinol. and Laryngol., September, 1921.

laryngopharynx, the upper margin of the mass being on a level with the tip of the uvula.

The treatment carried out in these cases consisted in radium applications both inside the larynx and outside the neck. The patients were placed under ether anesthesia and suspended by means of a Lynch suspension apparatus. Except in a few of the early cases no attempt was made to remove the papillomas. A small tube, containing the emanations or the radium salts, was inserted into the glottis and held there by means of forceps. The tube was kept moving under direct observation so that no particular area was over-treated, and so that the part needing treatment received it. The patient was kept asleep during the entire treatment and from 75 mg. to 150 mg., or millicuries, of radium were used for from 20 to 35 minutes or longer, depending on the particular condition. No screening was used except the silver tube which contained the salt or emanation, and was less than 1 mm. thick. As a rule the patients were treated about once in six weeks or two months. If recurrence was noted, further treatment was given before the recurrence became marked. The parents were always told that unless the child could be brought back at definite intervals it was of little use to begin treatments. The most suspensions given in one case were six and the least one. Besides these suspension treatments radium was applied outside the larynx; as a rule about 3,000 mg. hours were given, using 2.5 cm. of wood and 2 mm. of lead screening. These external applications were frequently given between the suspension treatments. The author reports very satisfactory results, much more so than with any previous method used.

Laryngeal Tuberculosis from the Point of View of the Pulmonary Specialist. The failure upon the part of the pulmonary specialist and general practitioner to recognize that the larynx is an essential part of the respiratory system which must be studied in every complete pulmonary examination, is declared by C. L. Minor[2] to delay disastrously the early diagnosis of this disease in many cases. He makes a plea for the more frequent use of the laryngoscope by internists and chest specialists, for with its aid an earlier diagnosis is often possible, thereby greatly increasing the chance of a cure. In too many cases, such an examination is postponed until pronounced laryngeal symptoms appear, when the case is then sent to the laryngologist, who too often finds it so far advanced as to offer little prospect of successful treatment. Consequently, the laryngologist, unless he lives in a pulmonary health resort and sees the early incipient cases, is likely to form an unduly pessimistic view as to the curability of laryngeal tuberculosis, and, therefore, fails to take an active interest in its treatment.

The changes which occur in the larynx are classified by the author as catarrhal, infiltrative, ulcerative, and tumor-forming. Formerly, much stress was laid on the value of changes in color of the mucous membrane and in the discovery of pallor of the soft palate or larynx proper, but the author does not believe these points have much diagnostic significance.

As to the catarrhal conditions, they are not in themselves diagnostic of tubercle. A number of tuberculous patients show a generalized laryngeal catarrah which frequently precedes the outbreak of definite tuberculous trouble, but of course no diagnosis can be made on this. When, however, the catarrah is unilateral, patchy, and persistent on one part of one cord while the other side is normal, it has great diagnostic significance and is not likely to be found in any condition except tuberculosis. A grayish wrinkling and thickening of the mucous membrane of the posterior commissure is found in a large number of tuberculous cases and often appears early in the generalized catarrhal stage. It

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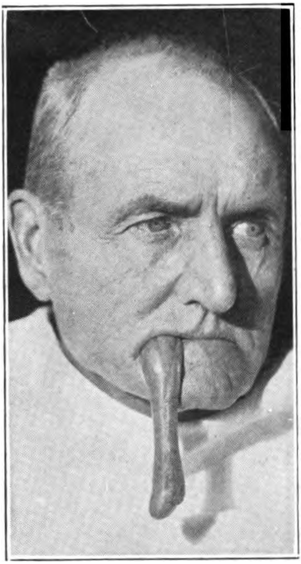
(2) Ann. Otol., Rhinol. and Laryngol., December, 1921.

should be watched carefully and looked upon as an early step toward more definite laryngeal manifestations.

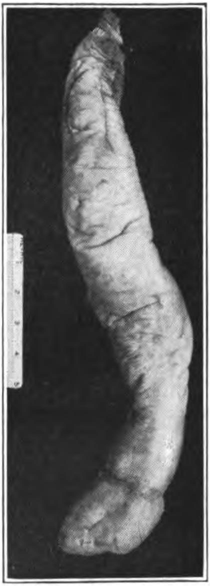
The commonest site of infiltration is in the posterior commissure, more usually central, but also to one side or the other. The table-like elevation of the posterior commissure centrally located is a very reliable early finding. These elevations often contain a groove down their centers. While this condition may be produced in some cases by catarrh, the author thinks it is extremely diagnostic of laryngeal tuberculosis. Sometimes the center of such an elevation breaks down into an ulcer, which may remain localized or spread forward on to the insertion of the cords on one or both sides. When the thickening is not central but eccentric, it is apt to involve the posterior insertion of the true cord and thicken the posterior end of the cord at the same time. The processus vocalis may be enlarged and the whole posterior portion of the cord reddened and thickened, and, if bilateral, the intervening mucous membrane is wrinkled and red, or sometimes gray. Infiltrations or ulcerations of the ary-epiglottic folds do not occur early, but a reddened infiltration of the true cord, localized and not involving the whole cord, but only a small portion of it, is not caused, in the author's opinion, by anything but tubercle. At times infiltration of the false cords may be very massive, the enlargement being vertical as well as horizontal. The epiglottis is not so common a site of early changes as the regions already referred to.

The early ulcerations of the larynx show themselves first either on the center of the posterior commissure or at the insertion of the posterior end of a cord, or localized on a small area of the free edge of the cord. The typical mouse-like eating out of the edge of one cord which the author believes to be always caused by tuberculosis, appears somewhat later. It is evident that ulcerations follow infiltrations, so the former follows the later in sequence. However, they sometimes appear

PLATE XXVII.

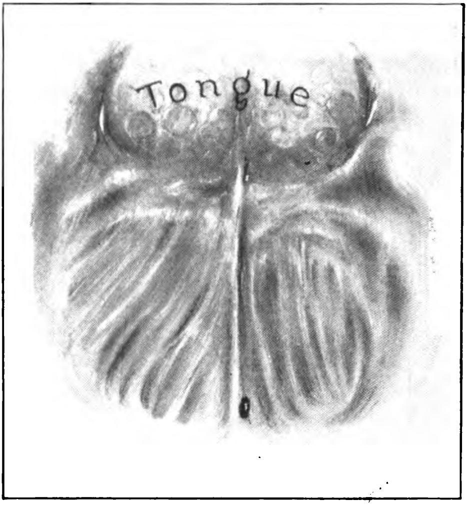


Protruding tumor.

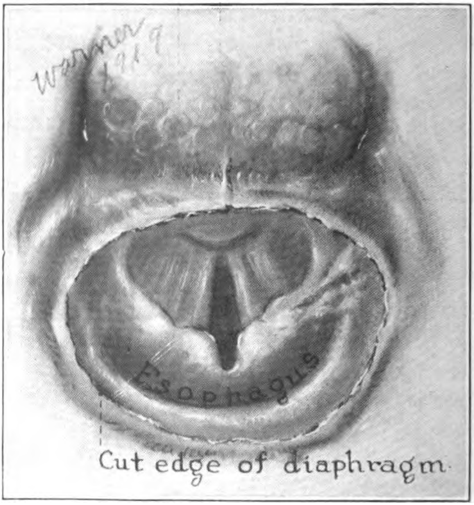


Tumor after removal.—Vinson, page 405.

PLATE XXVIII.



Cicatricial diaphragm of the laryngopharynx as seen by suspension laryngoscopy.



Postoperative appearance.—New and Vinson, page 409.

very early, and if treated with lactic-acid-glycerine or formaldehyde-glycerine the results are admirable. Ulcers of the false cords are not very amenable to treatment, and those of the epiglottis even less so. The latter tend to spread rapidly in spite of the best of care, and are very painful. Such excellent results have been obtained in epiglottidectomy that Minor thinks it not worth while to treat them, but amputates as soon as possible.

Tumor formations, with one exception, are not early. The one referred to is a small, long-pointed tumor, subglottic in origin, and appearing from underneath the anterior commissure, protruding like a small nipple. It is usually slow in growth and treatment gives rather favorable results, although at times it may produce troublesome hoarseness.

In the treatment of the catarrhal cases, simple mild alkaline or oil sprays are very beneficial. When infiltration is present, the author has secured wonderful results by the insufflation of powdered iodoform. A gradual reabsorption of the infiltration takes place. The patient can easily carry out this treatment himself. In the ulcerated cases good results have been obtained with lactic acid and formaldehyde glycerine. The patient had best be sent to the laryngologist for the local applications in these cases, unless the lung specialist is especially skillful in the use of the laryngeal applicator. The laryngologist labors under the difficulty that he can not have his patients under his eye and their lives as strictly supervised as can the lung specialist. The author, therefore, urges the two specialists to come closer together, work more in unison and help each other solve the various problems relating to these unfortunate patients.

Chaulmoogra Oil in Treatment of Tuberculous Laryngitis. R. M. Lukens[3] reports the use of chaulmoogra oil in a series of sixty cases of tuberculous laryngitis with very gratifying results. The treatment of these

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(3) Jour. Amer. Med. Ass'n., Jan. 28, 1922.

cases was carried over a period of eight months, and was conducted more to learn the effects on the pathologic lesions of the larynx and the symptoms than on the bacillus itself, for laboratory studies have shown that this oil is not a tubercle bacillicide.

Chaulmoogra oil gave promising results from the beginning in cases in which there were dysphagia and pain in the throat. Other oils used proved simply emollient, while chaulmoogra oil, in the majority of cases, exerted an analgesic action on the larynx which became more complete after repeated treatments. The treatments are much more easily borne than in the case of other drugs used, a pleasing sensation of warmth in the throat and chest remaining for some time following each treatment. In the cases in which intratracheal injections were made, the sputum was rendered more fluid and was expelled with greater ease.

The oil works best by intratracheal and intralaryngeal injection; 1 c.c. of a 10 to 20 per cent. preparation of the oil in liquid petrolatum or olive oil, is drawn up into a Luer syringe armed with a metal Eustachian catheter. While the patient holds the tip of the tongue, the syringe is introduced, guided by the throat mirror, into the pharynx (not the larynx) above and behind the epiglottis, care being taken not to touch any portion of the mouth or throat. Two-thirds of the contents of the syringe is discharged, drop by drop, into the trachea while the patient breathes quietly. The remainder is then dropped on the cords while the patient phonates. Cough following injection is very slight and often absent.

The chief value of chaulmoogra oil is in the relief of pain and dysphagia. This relief is continuous, which is in contradistinction to that produced by cocaine.

Arrested Laryngeal Tuberculosis. This case of a remarkable arrest of tuberculous laryngitis reported by H. S. Wieder[4] was in a Russian woman, aged 33, who first

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(4) Laryngoscope, December, 1921.

presented herself for examination in April, 1918, with a history of four months' pregnancy, at the beginning of which she became hoarse, the hoarseness gradually becoming more and more marked. At that time the larynx showed distinct infiltration of the right vocal cord anteriorly and in the subglottic region, rendering the cord rigid, and interfering with approximation in the midline. The patient was soon lost sight of and did not report again until four months later with a decided dysphagia and absolute aphonia. There was dense infiltration of both arytenoids and ventricular bands with probable ulceration of the posterior ends of the vocal cords. A report of advanced tuberculous laryngitis was made and the immediate termination of pregnancy advised.

The advice was not taken and the patient was delivered at full term. Following delivery an unfavorable prognosis as to life was given, and she was placed in a hospital where she remained for about three months, during which time she greatly improved in general health, gaining in weight and improving in color. She reported again to the author at this time, being almost aphonic in spite of her general improvement. Examination still showed marked infiltration of the arytenoids and ventricular bands. Under continued applications of lactic acid 25 per cent., formalin 2 per cent., glycerite of tannic acid and argyrol, with forced feeding, open-air *régime* and vocal rest, the patient improved rapidly, increasing in weight from 95 lbs. to 148 lbs., while the vocal lesions gradually disappeared. The infiltration entirely disappeared, only a slight thickening of the cords remaining. Physical and *x*-ray examinations showed the presence of chronic fibroid tuberculosis involving the apices of both lungs, but which was apparently healed at the time of this report.

Treatment of Tuberculous Laryngitis by Suspension Laryngoscopy. That endolaryngeal operations should be performed by the method with which each individual operator is most expert is the opinion of L. W. Dean[5] He, however, uses suspension in a majority of his cases of tuberculous laryngitis requiring operative interference, with results that have surpassed those obtained by any other method. Using proper precautions, endolaryngeal operations may be performed upon the tuberculous larynx by suspension without detriment to a co-existing quiescent pulmonary condition. All the author's patients are under close watch of lung experts and no bad effects have been detected. These chest specialists also pass upon all cases previous to operative interference and decide which patients shall undergo suspension and when they are ready for it.

Unless there is some contraindication for suspension, the author believes it is the procedure of choice for endolaryngeal operations on the tuberculous larynx. The well-illuminated larynx is thoroughly exposed. Both hands of the operator are free. He may have in one hand a spatula to expose better or to protect a certain area in the larynx, and in the other his galvanocautery point, punch or curette. He is at liberty to turn to his instrument table and select, if necessary, a different instrument without interfering with his work. There is no hurry, one being at liberty to work carefully and cautiously. The suspension method is indicated only in children old enough to be controlled and in adults. The use of a general anesthetic in this class of patients should not be considered. Morphine gr. $1/4$ and atropine gr. $^1/_{120}$ are given hypodermically 20 minutes preceding the operation; 10 per cent. cocaine solution is applied to the larynx with a cotton swab. Immediately following the operation the patient is placed in a croup tent for six hours. No post-operative edema or hemorrhage of any consequence has been observed. The author also uses direct laryngoscopy, many of his patients having work done by this method before the

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(5) Ann. Otol., Rhinol. and Laryngol., December, 1921.

pulmonary expert considers them sufficiently quiescent for suspension.

Treatment of Cough by the Laryngologist. Coughs in which the laryngologist is interested are divided by A. I. Weil[6] into four groups as follows: (1) Reflex cough; (2) coughs due to pathologic conditions in the nasopharynx and throat; (3) the true tracheal and bronchial cough due to inflammation and irritation in these regions, and (4) coughs due to pulmonary disease. It is with the third group and some cases in the fourth group that the author has had very gratifying results in the injection of tracheal oils. Watery solutions injected directly into the trachea give rise to laryngospasm, extreme tracheal irritation, and strangling cough. Fortunately, this is not true of oily solutions, and the medical remedies that are best for this work are soluble in oil. Camphor, menthol, and chloretone are all soluble in oil, and are all mild but distinctly effective analgesics, especially on the mucosa of the air passages.

The stock prescription used so successfully by the author is:

Camphor	grams	8
Menthol	grains	20
Oil of eucalyptus	minims	8
Chloretone	grains	10
Adrenalin inhalant	drams	2
Liquid alboline	q. s. ad. ounces	2

Technique of injection is simple: An ordinary laryngeal syringe containing one or two drams of the solution, is introduced under the guidance of the laryngeal mirror, so that the tip of the cannula is behind the epiglottis and just over the opening of the glottis. The patient is asked to breathe slowly and rather deeply and as the cords open wide the solution is injected between them into the trachea. The treatment should be repeated daily at first, then gradually at longer intervals as the condition improves.

Cases of bronchial asthma are also greatly relieved

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(6) New Orleans Med. and Surg. Jour., April, 1922.

by this method. In pulmonary tuberculosis this treatment is merely palliative but much may be accomplished by allaying the tickling cough, thus giving more comfort and allowing the patient more rest and sleep. It also helps to keep the mucosa healthy, thus possibly preventing laryngeal tuberculosis.

Laryngeal Diphtheria. The most important question that confronts the public health officials and communicable disease workers is to find a remedy that will lower the death rate in laryngeal diphtheria. J. F. Hogan[7] makes a plea for earlier diagnosis in these cases, and states his belief, that with the use of antitoxin and the laryngeal tube, the death rate in laryngeal diphtheria should be practically *nil*. For the years 1919 and 1920 there were 246 deaths in the city of Baltimore due to diphtheria of various types, and of this number, 202, or 82 per cent., were laryngeal diphtheria. It appears quite evident that there is a tendency not to diagnose this condition in time, and, when it is diagnosed, too great a delay is permitted before intubation is resorted to. The proper time to intubate is when the recessions of the intercostal spaces occur and not to wait until cyanosis appears.

In only 83 per cent. of the 202 fatal laryngeal cases cited above was antitoxin administered. The maximum dose given was 100,000 units and the minimum dose 2,000 units. Sufficient dosage of antitoxin is given in but very few cases of diphtheria of the larynx. Early administration of large doses is very important.

A most erroneous belief is that diphtheria of the larynx can not exist without clinical manifestations of the disease in the pharynx, posterior nares, or nares. It should be remembered that in many cases of the laryngeal type there is no pseudo-membrane, and in some few not even a hyperemia of the pharynx. Yet the edema in the larynx may be quite sufficient to cause death by mechanical obstruction unless intubation is

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(7) Jour. Amer. Med. Ass'n., Aug. 27, 1921.

resorted to promptly. If marked dyspnea is present, antitoxin will not act quickly enough in these cases to overcome the necessity of intubation.

Removal of Diphtheritic Exudate from the Larynx. The various factors which complicate intubation led Charles A. Thomson[8] to devleop a method for the removal of diphtheritic membrane from the larynx in order to avoid the insertion of an intubation tube. In taking cultures directly from the larynx he was frequently impressed by the fact that in a large number of the cases the dyspnea was caused either by loose membrane which was drawn into the lumen of the larynx by inspiration, thus occluding it, or by a thick mucopurulent material which the patient seemed to be unable to cough up. In only a few cases was the dyspnea due to the attached membrane alone or to an inflammatory stenosis. It was further noticed that this loose membrane came away frequently on the swab; the coughing that folowed the withdrawal of the swab frequently expelled the mucus, with the result that the child, who was sometimes ready for intubation, received immediate marked relief, which lasted in some cases for from six to ten hours. An attempt was then made to bring about a more thorough removal of this membrane. A straight applicator with a screw clasp on the tip to which a piece of gauze could be firmly attached proved very suitable for this purpose. The gauze plug was just large enough to pass into the lumen of the larynx without using force. Under direct laryngoscopy this was passed into the larynx just below the cords, and immediately withdrawn. The withdrawal of the swab brought with it a large amount of the mucus and frequently good sized pieces of loose membrane. In a few cases a complete cast was removed. The remaining mucus was effectually removed by the coughing that followed.

The result from this procedure was surprising in many

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(8) Jour. Amer. Med. Ass'n., April 22, 1922.

cases; patients who were cyanotic and perspiring received as much relief as from intubation. This relief lasted from eight to ten hours and in some cases was permanent. The applicator treatment usually had to be repeated two or three times. In some cases, however, intubation had to be resorted to on account of the presence of an inflammatory stenosis. In no cases did pneumonia develop as a result of the treatment and it was noted that aphonia disappeared earlier in these patients than in those in whom intubation was performed.

Acute Stenotic Laryngitis Simulating Laryngeal Diphtheria. The diagnosis between these two conditions is often very difficult. In the milder forms of stenotic laryngitis differentiation is usually simple; yet even here one finds that the ordinary clinical methods are not sufficient. Among the signs listed by C. A. Thomson[9] as being suggestive of stenotic laryngitis, as against laryngeal diphtheria, are the barking cough, lack of aphonia, and higher temperature. However, these may be present in diphtheria, for if the pseudomembrane is confined to the ary-epiglottic folds, with but little extension of the inflammation downward, the voice may be perfectly good. Pharyngeal cultures are not to be relied upon.

In the author's series of 697 cases of laryngeal diphtheria 38 per cent. showed nothing in the throat. The primary cultures taken directly from the larynx were positive for the Klebs-Loeffler bacillus in 85 per cent. of these cases, while those taken from the throat were positive in only 50 per cent.

Direct laryngoscopy offers the best means of diagnosis, and, while not infallible, reduces the limit of error to a small margin. Direct inspection shows congestion and swelling of the ary-epiglottic folds and arytenoids, swelling of the ventricular bands, reddened cords, and a greater or less degree of subglottic stenosis. In the

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(9) Jour. Amer. Med. Ass'n., May 13, 1922.

severer forms this stenosis is more marked than that usually encountered in diphtheria.

Of 810 patients sent to the Willard Parker Hospital as having laryngeal diphtheria, 697 proved by direct examination to have diphtheritic laryngitis and 113 acute stenotic laryngitis. A membrane was demonstrated in all of the 697. Of the 113 none had a membrane and all had several negative cultures taken direct from the larynx. Out of the 113 patients, fourteen required intubation, nine of these died of bronchopneumonia. The majority of the patients recovered in a few days, although in a few the dyspnea lasted for a week or more. Several of the patients developed a rash from measles or scarlet fever within from twenty-four to forty-eight hours.

Intrinsic Cancer of the Larynx. In a series of fifty cases of intrinsic cancer of the larynx, in which the diagnosis was confirmed by indirect laryngoscopy, by direct inspection at a laryngo-fissure, and by histologic examination, St. Clair Thomson[1] draws a series of conclusions that are more or less in opposition to some of the earlier teachings, especially those of Virchow and Semon.

As Regards Location:

1. Intrinsic cancer of the larynx originates on the vocal cords or in the subglottic area.
2. It has never been found in the posterior commissure (interarytenoid region), nor originating from the ventricular bands or the ventricle of Morgagni in any of the fifty cases studied.
3. A malignant growth may originate on any part of a cord, but is more common in the central portion or anterior half than in the posterior area of the larynx.
4. An epithelioma originating in this region remains for a long time limited to the cord affected and the adjoining side of the larynx, but it may cross the an-

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(1) Brit. Med. Jour., June 25, 1921.

terior commissure and, in later stages, invade the other side.

5. The inner surface of the cord may be affected primarily or by extension. The subglottic area may be invaded by a growth originating in a cord or by one primarily starting there.

6. A subglottic cancer is much more common in the anterior than in the posterior half of the larynx.

As Regards Prognosis:

1. The superficial or projecting tumors of limited extent are the most favorable.

2. Those situated in the middle third or anterior half of the cord are more promising than those invading the anterior commissure in front or the arytenoid region behind.

3. Growths embedded in a cord, or extending into it below an intact mucosa are not so favorable, and those extending along the inner margin of a cord are still less favorable.

4. Subglottic cancers are very unpromising as regards a lasting cure.

The author believes that in the treatment of these cases the growth should be removed in one mass through a laryngo-fissure, including a wide margin of healthy tissue all around it. However limited the growth may be, the entire vocal cord should be excised.

Primary Scleroma of the Larynx. Scleroma of the upper respiratory tract is a very rare disease in this country. A few cases have been reported but all that are authentic have occurred in immigrants from Europe. S. Shelton Watkins[2] reviews the history of the disease and reports a case of primary scleroma of the larynx in a negro born in Maryland, who had not been out of this country except to the West Indies and Central American countries as a marine fireman. This, and one other case, are the only two that have been encountered in some one and a half million patients treated

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(2) Surg., Gynec. and Obstet., July, 1921.

in the wards and out-patient department of the Johns Hopkins Hospital during the past thirty years; the other patient was an immigrant who had been treated in Berlin before coming here.

The disease was first described in 1870 by Hebra, who named it *Rhinosklerom*, because the nasal passages are often primarily involved. It is endemic in various countries of Europe, mainly in the southern part. The etiologic agent has not been definitely determined, but it is generally believed to be an organism closely resembling the Friedlander bacillus. However, no one has succeeded in reproducing the disease in animals. The mode of spread is not known, but some authors consider it contagious and recommend that these patients be isolated. It occurs chiefly in small villages where living conditions are very unhygienic.

The clinical course of scleroma is very slow, some cases lasting from twenty to thirty years. It does not prove fatal except when the larynx, trachea, or bronchi are so much involved that suffocation ensues. A certain diagnosis can not be made without a microscopic study of a piece of the diseased tissue. Clinically, the points in favor of scleroma are: marked chronicity, absence of tissue destruction and of pain, an ivory hardness of the lesions, and European nationality of the patient.

All forms of treatment are almost valueless in the end stages of the disease. In the early stages the *x*-ray and radium have been used with more success than any other agent.

The author's patient was a colored man, aged 23, born in the United States. He stated that three years previously he had suffered an attack of "short windedness" which lasted for about twelve hours. No pain or difficulty in swallowing was present. He experienced no more trouble for six months when he had two more attacks within four days, each lasting about six hours. Three weeks previous to entering the hospital he began to have difficulty in breathing which gradually grew worse. He was compelled to sit up in bed. He died six days after entering the hospital.

The indirect laryngeal examination showed nothing abnormal above the vocal cords except slight edema of the arytenoids. Edematous red tissue was seen below the cords which was evidently producing the obstruction.

At autopsy the trachea was opened from below upward and a thickening of the mucous membrane began to occur at the lower level of the isthmus of the thyroid. This gradually increased until at the level of the cords there was almost complete occlusion. There was some superficial ulceration and granulations, covered with a grayish exudate. Pathologic examination of the tissue proved the tumor to be a scleroma.

Hemangioma of the Larynx. A case of this rather rare condition is reported by T. H. Sweetser.[3] The patient was a baby boy who died of laryngeal obstruction at the age of 2 months, the exact diagnosis of the condition being made at autopsy. At the age of 9 days the baby had a series of attacks of cyanosis with poor respiration, tachycardia, and cardiac arrhythmia. Administration of oxygen afforded relief. A feeding of breast milk was regurgitated, deeply colored with red; apparently blood. The baby was unable to swallow the next two feedings, but the condition gradually improved and there was apparently no more trouble until five days preceding death, when breathing again became very difficult. The child was finally sent to the hospital and an intubation attempted, but the tube could not be introduced into the larynx, the child dying within a half hour after admission.

Autopsy revealed a large hemangioma in the larynx within the circle of the cricoid cartilage, the upper border extending to a level 2 to 3 mm. below the true vocal cords and extending downward for a distance of 5 mm. to the lower border of the cricoid cartilage. It

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(3) Laryngoscope, October, 1921.

occupied the entire circumference of the larynx with the exception of a narrow zone at the posterior commissure.

The author suggests that a low tracheotomy may have prolonged life in this case. However, tracheotomy in such cases is not void of danger, for severe hemorrhage may be encountered if the tumor is incised upon making the opening into the trachea. In any case the opening must be made low down. Radium application is the only safe method of treatment. Surgical removal of the tumor either intra-laryngeally or through laryngotomy is a distinctly dangerous procedure.

A Cigarette Holder in the Larynx. N. Hay Bolton[4] reports the case of a Chinese boy, aged 10, who while sucking a Chinese wire cigarette holder, had suddenly "swallowed" it. He was brought to the hospital four days later and there seen by the author for the first time. With a laryngeal mirror, it was just possible to see the upper end of the cigarette holder, tightly gripped between the false cords. The lumen of its tube constituted all the available space through which the child could breathe.

The patient was too cyanotic and in too poor physical condition to stand a bronchoscopy; so the foreign body was removed through a tracheotomy incision with good results.

The cigarette holder was 2½ inches long and ⅜ inches in diameter.

Laryngectomy. Among the reasons for the unpopularity of the operation of laryngectomy, Sir Robert Woods[5] lists the following: The magnitude of the procedure; the great extent of the cellular spaces open to infection; the impossibility of avoiding some contamination of the wound from the throat, and the consequent danger of sepsis; the difficulties connected with the feeding and nursing of the patient during convalescence;

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(4) Lancet, March 12, 1921.
(5) Surg., Gynec. and Obstet., March, 1922.

the certainty that in extrinsic cancer, under which heading comes the majority of cases, the deep cervical glands are contaminated very early; and, finally, the great tendency of the disease to recur. The greatest obstacle to success, however, has been removed by the introduction of the nasal tube for feeding purposes.

The author reports a series of twenty-seven cases operated upon, which he divides into two classes: those in which the larynx alone was involved, and those in which the hypopharynx or gullet proper was involved. In the latter class the results were poor. Recurrence of the disease was invariable and in those cases in which life was prolonged over a matter of months, there was always some difficulty about the management of the apparatus designed to keep the esophagus open, which necessitated the patient living within reach of the operator. Cancer involving the food passages low down in the neck is, in the experience of the author, one of the most hopeless conditions with which one can be confronted. Of five patients operated on, two died within two weeks, and the other three survived for about six months.

Of those cases in which the larynx alone was affected the author reports twenty-one with the following results: Three patients died within a month; two within a year; four within two years; one within three years; one within five years, and one within eight years; while nine are still alive from three to nine years after operation.

As regards comfort and enjoyment of life, the author believes that these individuals are no worse off without the larynx than with it. Swallowing is not interfered with and the tendency to bronchitis no greater than among ordinary individuals. The problem of speech has always been a serious one, but the author teaches his patients a method of making themselves heard very satisfactorily. As soon as the feeding tube is removed they are taught to gulp air into the esophagus and allow it to escape as a belch. The physical difficulty of this is much less in cases in which the larynx has been removed. Solution of citric acid followed by bicarbonate of soda may be administered, the carbon dioxide escaping with a noise that makes a perfect substitute for the voice, and the patient is instructed to watch his opportunity and to form it into a vowel in its transit. After acquiring this trick, all that is necessary is to keep a reservoir of air in the esophagus in order that he may speak audibly and continuously.

Laryngectomy for Cancer. G. W. Crile[6] is very firm in his belief that there is a vast difference in operating on extrinsic and intrinsic carcinoma of the larynx. In the intrinsic type we have a closed box from which the cancer can not escape, except by growing upward into the hyoid space. The type of growth therefore determines the prognosis. The interior of the larynx has almost no lymphatic tissue and intrinsic carcinoma does not require resection of the lymphatic glands.

Crile divides the operation of laryngectomy into two stages. In the first stage the trachea is well separated from all surrounding tissues and walled completely off with iodoform gauze, and at the second stage the trachea is opened, the larynx removed and the end of the trachea sutured into the incision. By this method infection is avoided. The author has done this operation thirty-five times since starting to use the method, the larynx being removed completely in each case; of this number he has lost only two patients. The oldest patient has now been well twenty-eight years since the operation.

Treatment of Malignant Tumors of the Pharynx and Larynx by Diathermy. This method of treatment of malignant growths about the mouth and throat is used by Frank J. Novak[7] with good results. The great problem of diathermy has been the perfection of a high frequency apparatus capable of producing a current

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(6) Surg., Gynec. and Obstet., March, 1922.
(7) Ill. Med. Jour., April, 1922.

of low voltage, of high amperage, and of extremely high frequency. The new Victor apparatus used by the author in this work produces a deep penetration of tissue, without carbonization, because it eliminates the undesirable spark of the older machine, and, moreover, produces no muscular contractions. The heat produced is the result of the resistance of the tissues to the high frequency of the D'Arsonval current.

The basis upon which the whole theory and practice of diathermy rests lies in the following facts: The local application of sufficient heat to a neoplasm destroys the tumor mass. The application of lower degrees of heat to the periphery of the tumor mass and beyond its limits results in the inhibition of the growth of the migrating neoplastic cells. The dissemination of these cells throughout the organism is further prevented by the occlusion of the lymph spaces and channels, and further by the formation of scar tissue which forms a most desirable barrier against the new growth. Diathermy is believed by the author to offer advantages over surgery in the treatment of malignant tumors of the larynx because not only is the mass of tumor destroyed, but the deep penetration of the high degrees of heat destroys or at least inhibits instead of stimulating the neoplastic cells in the zone just beyond the periphery of the gross tumor mass; and it prevents metastases by closing the lymphatics and blood-vessels by coagulation. Better results are obtained by electrocoagulation supplemented by radium than by either of the two alone.

The larynx is best exposed for this work by suspension laryngoscopy and the author believes the anesthetic of choice is chloroform, ether of course being impossible on account of the danger of ignition, and nitrous oxide not giving a sufficiently even degree of anesthesia to make it available in this work. A preliminary tracheotomy is imperative in all these cases.

A Direct View, Self-Retaining Laryngoscope. A new self-retaining laryngoscope has been devised by M. Unger.[8] It is easily introduced, permits wide exposure, and is adaptable to all classes of cases requiring direct exposure of the larynx (Fig. 23). There are six sizes of the tongue blades, allowing the use of the instrument on patients of all ages.

The patient is placed on a table, face upward, with the head hanging partly over the edge. The laryngoscope is introduced in the usual manner and the epiglottis caught by the tip and lifted upward. The palate blade is then slipped inside the upper teeth and into contact with the hard palate back of the teeth. The instrument is then adjusted to correct position by the two screws. By this means the distal end of the tongue blade may be tilted up exposing the anterior commissure. The action of the two screws helps to wedge the instrument into the mouth, making it self-retaining.

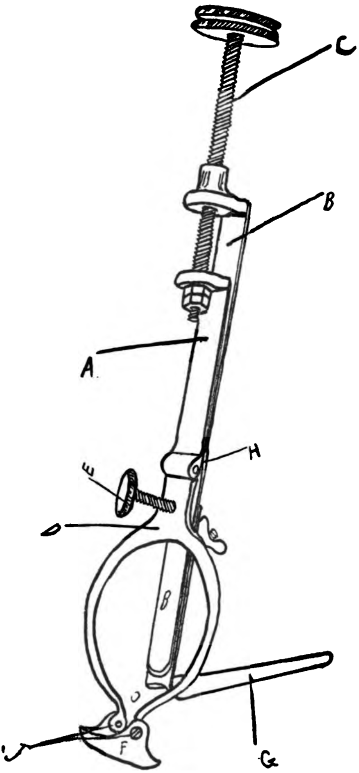

Fig. 23.—Self-retaining laryngoscope (Unger).

An Auto-Injector for Intra-Laryngeal and Intra-Tracheal Medicated Oils. This instrument, devised by B. S. Jones[9] for the injection of medicated oils into

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(8) Laryngoscope, November, 1921.
(9) Jour. Laryngol. and Otol., February, 1922.

the larynx and trachea, is so arranged that the patient can use it himself for home treatment. It consists of a metal U-shaped tube, the ends of which are bent at right angles to the arms. A soft rubber catheter is attached to one end and a rubber bulb to the other. The medicated oil is placed into the tube through a small orifice with a glass pipette, and the free end of the catheter inserted along the floor of the nose into the pharynx (Fig. 24). It should be of such length that the distal end hangs about 2 inches below the margin of the soft palate. The patient holds the metal tube with the left hand, the forefinger covering the small orifice to prevent the escape of air, and on slow, deep inspiration, forcibly compresses the bulb two or three times with the right hand. This forces the oil into the larynx and upper part of the trachea.

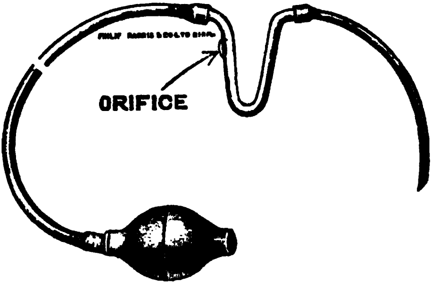

Fig. 24 (Jones).

It is especially valuable in cases of tuberculous laryngitis. The author obtained excellent results with the use of chloretone inhalant, ordering an injestion once each day, although some patients used it as often as two or three times a day. The instrument is made by Messrs. Philip Harris & Co., Edmund St., Birmingham, Eng.

VOICE AND SPEECH DISORDERS.

JAMES SONNETT GREENE, M. D.
NEW YORK CITY.

The Medical Significance of the Disorders of Speech. According to Smiley Blanton,[1] speech disorders are early and invaluable symptoms of anomalies of intellectual and emotional growth as well as organic difficulties of the nervous system. He discusses the four groups commonly encountered as follows:

1. Delayed Speech: This has both its organic and its functional form. The organic form is due to poor intelligence or defective hearing. The functional form is due in some cases to faulty family attitude.

2. Letter Substitution: This is commonly called lisping and lalling, and is the substitution of one letter sound for another, such as *th* and *sh* for S, and Z and W for R. This disorder is most often caused by faulty occlusion of the teeth and malformed palatal arch. There is a second type which is apparently a simple hang-over of early childish habits. There is a third type in which the intelligence is good, but in which the personality as a whole is infantile.

3. Oral Inactivity: This disorder has been known under the names of ideoglossia, baby talk, etc. It has been much neglected and relegated to the field of the elocutionist. The parents of children so affected have always been told that the child will outgrow this disorder, but facts prove the contrary.

4. Stuttering: Under this we include stammering; it may be described as a break in the rhythm of speech, due to a blocking or inhibiting of the muscular coördinations. It may not be considered as a disease entity, but rather as a symptom of any of a number of underlying conditions.

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(1) Jour. Amer. Med. Ass'n., July 30, 1921.

Blanton summarizes his article as follows:

"We believe the disorders of speech to be due to the lack of ability to adapt emotionally to social situations, or to a faulty motor mechanism, either hereditary or acquired. We believe that the most worth while results which are obtained at present are those which aim at the underlying cause, and general hygiene and muscle training, and that training aimed at the alleviation of the symptom alone is pernicious because it obscures the issue and in hysterical cases actually 'sets' the disorder. We feel that this problem, for so many years left in the hands of quacks and charlatans and untrained people, is most distinctly a medical problem, and that neuro-psychiatric training is necessary for the diagnosis and treatment of these patients. Nor can we too strongly urge the necessity for training medical students in the value of speech disorders as a significant symptom."

Disorders of Symbolic Thinking and Expression. Henry Head[2] states that speech is a discriminative movement capable of fine degrees of adjustment; it is essentially an intellectual mechanism. The more nearly the mental state approaches pure feeling, the less easily can it be expressed in words alone, apart from gesture and the tone of the voice. Even in the gravest cases of aphasia the patient is evidently fully aware of his emotions and can express them clearly in gesture and action. . . . The fact that speech can be disorlered by injury to the brain is one of the most wonderful means placed in our hands for investigating the relation of mind and body. Observers began to seek for some mechanical explanation of this indisputable fact. Investigations and tests carried out by the writer led him to formhlate the following points:

"1. A unilateral lesion of the brain, affecting the use of language, disturbs a number of psychical processes, which can not be grouped under such headings

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(2) Brit. Jour. Psychol., January, 1921.

as 'speech,' 'reading,' 'writing,' 'motor,' or 'sensory' activities, or any other *a priori* categories.

"2. I have ventured to apply to them the term 'symbolic thinking and expression,' because they consist mainly of the use of symbols in language and in thought; but it is symbols used in a particular manner which are affected, and not all symbolic representations. This term is in no sense a definition, for this group of functions can not be comprised within any single general conception; they can be determined solely by experimental observation.

"3. The various manifestations of aphasia and allied disorders of speech can not be explained by destruction of sensory images. These may remain intact, although they can not be used voluntarily as part of the symbolic mechanism of language.

"4. These researches show that the two aspects of meaning inherent in the use of symbols may be separated by suitable lesions of the brain. Want of perfect recognition of verbal significance leads to a defective power of naming; whilst what I have called 'semantic defects' produce a loss of the general meaning of words, phrases, numbers and pictures."

An Unusual Case of Bilateral Abductor Laryngeal Paralysis. Gordon B. New[3] cites the case of a man who had had difficulty in speaking for the last few months and the character of his voice had changed in the last ten days before consulting him. Besides that, the patient showed general muscular atrophy of the upper and lower extremities with resultant impaired function.

When the patient's larynx was first examined, both cords moved quite normally. On repeated phonation the abductors on the right side completely gave out, and the right cord was in the position of complete abductor paralysis. On the left side the abductor gave out about one-half, and the abduction was graded 2

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(3) Laryngoscope, August, 1921.

on a scale of 1 to 4. After the patient had rested for from five to ten minutes the cords again moved quite normally. This phenomenon was repeated a number of times and was observed by physicians so that the change in the movement of the cords was unquestionable.

A partial or complete abductor paralysis due to involvement of the recurrent laryngeal nerve, or to central lesions, is often seen, but this is the first time that New has observed a case in which the use of the voice for a fraction of a minute tired out the abductors so that they could not function until rested. The condition of the nerve supply was responsible. New calls attention to the fact that he was unable to find in the literature a case in which the abductor muscles have given out under direct observation after repeated phonation, and have returned after rest to their normal function.

Three Cases of Central Speech Defects. In his records of speech disorders which he kept while at The Hague, Holland, Pook Van Baggen[4] classified the cases in the following three groups.

1. The peripheric-impressive, or perceptible defects in which the organ itself, or the nerve fibers which bring the impressions from without to the centers of speech, are destroyed or in a morbid condition.

2. The central speech defects in which the sensorial centers, or the motor centers, or the fibers associating these centers are affected. Of this group we distinguish again: (*a*) Central speech defects *with* anatomically perceptible alterations in the brain, and (*b*) central speech defects *without* anatomically perceptible alterations of the brain.

3. The peripheric-expressive, or articular speech defects which result from a disturbance in the motor fibers which unite the motor centers of speech with the muscles, or from a trouble in the articular muscles

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(4) Med. Record, Nov. 5. 1921.

themselves. He found that the great number of the cases were peripheric-expressive defects of speech. Also, the central speech defects *with* anatomically perceptible alterations are not numerous, while on the contrary the cases of central speech defects *without* anatomically perceptible alterations occurred very frequently.

A Departure in Hospitals. J. S. Greene[5] gives reasons why speech disorders must be treated in special hospitals. He says that as far back as we have any history there have been physicians, and for at least one thousand years we know that there have been persons with impediments in their speech—for is it not mentioned in the Bible, in both the Old and the New Testaments, in Isaiah, in St. Mark, and in other places?

From that time on to the present, scientific men have considered and written about defective speech, but strange as it may seem, it did not receive the attention it deserved from the medical profession, and to date when specialism is the outcome of progressive medicine, defective speech is still a neglected specialty.

While we have eye hospitals, nose and throat hospitals, skin and cancer hospitals, and numberless special institutions, we have not one general specialized voice and speech hospital in the entire United States. By that the author means a hospital devoted solely to the cure of patients suffering from various disorders of voice and speech.

The defective speech sufferers have been receiving courses of treatment from school teachers, Christian Scientists, osteopaths, and the very latest is chiropractic. For instance, a chiropractic professes to cure a stutterer by twisting his neck in single two dollar treatments or he twists it by the case for from $50 to $100, but to no avail. With it all those having speech trouble still carried their burden and kept on suffering.

These prevailing conditions demonstrated only too

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(5) Jour. Amer. Med. Ass'n., Nov. 26, 1921.

clearly for many years the ever-growing necessity for some central hospital or organization to help speech cripples and try to make life more livable for them; an institution or hospital whose policy it was to take a very broad view of its duty to all those who came under its care, particularly the poor and neglected; a dignified humanitarian type of institution approved by physicians of the highest ethical standing and irrevocably opposed to quacks and fads.

Since the founding of the National Hospital for Speech Disorders about 5,000 patients have applied for treatment. They had defective speech conditions due to harelip, feeble lips, cleft palate, relaxed palate, jaw conditions (protusions or recessions), teeth anomalies, tongue conditions; various voice abnormalities arising from palate or laryngeal conditions such as nasality, aphonia, hypophonia, phonesthenia and falsetto voices; also conditions of stuttering, stammering and lisping, deaf mutism, audimutitas and idioglossia. The author and his associates have seen numerous patients with diseases or conditions of nervous origin giving rise to various disturbances of speech, such as agitophasia (speech agitans), imbecility and idiocy, hereditary ataxia, progressive muscular atrophy, congenital hydrocephalus, spastic spinal paralysis, bulbar paralysis, syphilis, multiple sclerosis, Bell's palsy, post-diphtheritic paralysis; cases of tumors of the speech areas (aphasia), lesions of the medulla, epilepsy, chorea, spasmodic tics, hysteria, insanity. The number of conditions just enumerated will at once show the extent of speech disorders.

In Greene's summary in regard to treatment he says that to attempt to cure patients, especially those who stutter, without analyzing their psychology is a waste of time. And that besides the psychic factor there is always a physical factor present. Everything possible must be done to eliminate physical disability aside from the speech disability. The tendency to weaken and to fall away from set standards must be combated through education and re-education, which tends to overcome faulty voice or speech habits. The mind then gradually frees itself from the consideration of details, and the speech becomes subconscious and automatic. Investigations showed that social life was practically an unknown quantity in these patients. It was found that the social phase of the work is of the utmost importance in the cure of patients. Therefore a composite therapy of a psychologic, medical, educational and social nature is absolutely essential for the cure of those suffering from defective speech. The physician, the educator and the social worker are the greatest factors for good, when they are fused together in such a harmonious union that their adjustment completely saturates the maladjustment of the patients.

In order to carry out such a coöperative work, a departure in hospitals was necessary and prompted the founding of the National Hospital for Speech Disorders.

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